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# ON THE TWO MIRACLES, AFFECTING THE SUN, IN THE TIME OF JOSHUA, AND IN THE TIME OF HEZEKIAH, RESPECTIVELY: AND ON THEIR EFFECT UPON THE MEASURES OF TIME IN GENERAL, AND ON THE LUNAR MEASURE OF TIME IN PARTICULAR, AND ON THE PRECESSION OF THE EQUINOXES.

---

## A LETTER

TO

THE REV. JAMES CHALLIS, M.A.,

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AND TO

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FELLOW OF CORPUS CHRISTI COLL. OXON.

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# CHAPTER I.

## SECTION I.

### ON THE MOST ANCIENT ECLIPSES KNOWN FROM TESTIMONY.

The Chinese profess to have kept an account of a series of solar eclipses, the first of which has been thought to go as far back as B.C. 2159, though the next in point of time to that does not go farther back than B.C. 776. The history of the ancient Indian or Hindoo Calendar enables us to recover a solar eclipse, the date of which must have been October 24, B.C. 946: and Roman tradition in like manner ascertains the fact of another, which coincided with the true date of the foundation of Rome, April 24, B.C. 750.

All these eclipses however are of one kind, solar, not lunar. The accounts of them all are defective in many circumstantial particulars, especially those of the greatest importance; the quarter where they were observed, the time of the day when they happened, the magnitude of the eclipses themselves. And this is especially true of the earliest eclipses of the Chinese; among which there are but six, from B.C. 776 to B.C. 495, which Gaubil and his associates consider themselves to have verified.

There are ten other ancient eclipses, however, ranging from B.C. 721 to B.C. 382, which are of a different character, and entitled to a very different degree of estimation: and all these are lunar, not solar. With respect to these eclipses, there is no uncertainty as to the quarter where they were observed. They were all observed in ancient Babylon. There is no more reason to doubt that they were recorded at Babylon, than that they were observed at Babylon. The history of these eclipses is briefly *this*. We have been made acquainted with the facts and the dates of these eclipses, by the Magna Compositio of Ptolemy: Ptolemy obtained them from Hipparchus: and Hipparchus appears to have had the particulars of them purposely copied from the accounts at Babylon, and sent down to him at Alexandria, or at Rhodes; at one of which places he is supposed to have made his own observations. These eclipses are all described by Ptolemy in the words of Hipparchus: and that the description of each was actually copied from the Babylonian accounts, and that the description of each is to be received as a faithful transcript of the original account, may be fairly inferred from the observation premised to this description in the case of the first three of the number: *Τὸ μὲν πρῶτον ἀφ' ὧν ἔχομεν ἀρχαιοτάτων ἐκλείψεων τρισὶ ταῖς ἀδιστάκτως δοκούσαις ἀναγεγράφθαι συγχρησάμενοι* — (Lib. iv. cap. v. p. 243, *Halma*): and from the similar remark which precedes the production of the three last: *Ταύτας μὲν δὴ τὰς τρεῖς ἐκλείψεις παρατεθεῖσθαί φησιν* (sc. *ὁ Ἵππαρχος*) *ἀπὸ τῶν ἐκ Βαβυλῶνος διακομισθεισῶν ὡς ἐκεῖ τετηρημένας* — (Lib. iv. cap. x. p. 275.)

The truth is, as I have seen reason to conclude, the Chaldean astronomers first began to apply themselves to the regular observation of lunar phenomena, in B.C. 746. And to facilitate this observation, and more particularly that of lunar eclipses, the Apis Cycle was adopted at Babylon, for the first time, in that very year, though this Cycle had been both known and in use in Egypt, for more than two hundred years before: and the epoch or head of that Cycle at Babylon was fixed not to the *luna prima*, or new moon, but to the *luna decima quinta*, or full moon, which B.C. 746 happened to coincide with the first day of their solar year. · This, I say, is the true epoch of the lunar observations of the ancient astronomers of Babylon. They appear to have proposed to confine themselves exclusively to lunar eclipses. It is certain at least, that the date of a solar eclipse, observed and recorded at Babylon, is no where extant in all antiquity. And it is a curious coincidence, that a regular series of such observations having been thus begun at Babylon, in the first year of the first Apis Cycle there, B.C. 746, the earliest of these observations, of which we have any account at present, begins to appear in the very first year of the second Apis Cycle, B.C. 721.

Again; these Babylonian eclipses appear to have been all recorded from the first in terms of a particular æra, which chronologers call the æra of Nabonassar; the nature of which is at once understood, when it is explained to be a continuous reckoning of time by cycles or periods of 365 days and nights perpetually. There is no doubt that this was a proper Babylonian æra; first brought into being at Babylon at a certain time, and used there in particular ever after. The traditional account of this æra is, that it took its rise with the accession to the throne at Babylon of the oldest of the kings of Babylon, whose name and history are not mixed up with fable, viz., Nabonassar; and by his act or appointment itself; from which circumstance it derives its name. The epoch of this æra too is well ascertained. None of the æras of antiquity is more so. There can be no doubt, that in the reckoning of our own æra, B. C., the first year of this particular æra and B.C. 747, each being referred to one and the same day, are the same. Yet, why this celebrated Babylonian æra, the æra of Nabonassar, should actually have been dated from B.C. 747, whether Nabonassar himself really came to the throne at Babylon in that year, or not, involves a question which has never yet been fully explained; and which nothing but the history of the ancient Babylonian Calendar itself, from first to last, is competent to clear up and explain.

Again; the dates of some of these eclipses too, though not those of them all, are further authenticated by the years of the reigning kings; first, those of the kings of Babylon, and then, those of the kings of Persia, who succeeded to the kings of Babylon, and were kings of Babylon as much as any of the native Babylonians themselves. But the reckoning of these reigns is peculiar. The complex or series of these reigns altogether constitutes what is called the *Canon of Kings*, the *Astronomical Canon*, the *Canon of Ptolemy*, or the like; a monument of antiquity, the value and importance of which are very well known to all chronologers, though the structure of this Canon even yet is not fully understood; especially the technical rule by which it proceeds in its reckoning, from first to last. The origin of this Canon too is doubtful; and whether it was the work of one person or of more. In my own opinion, it was compiled at three different times; partly by Hipparchus; partly by Ptolemy; and partly by some one or other of the successors of Ptolemy at Alexandria: for it extends from the first year of Nabonassar to the end of the reign of Diocletian. These are questions, however, which are of no material importance at present. All that requires to be observed on this point is, that the Canon of Kings is merely another continuous æra, which is supposed to begin with the æra of Nabonassar, and to go on ever after without interruption, along with and parallel to it. The only difference between them all through is, that the Canon is referred to the æra of Nabonassar, and not the æra of Nabonassar to the Canon. The reigns in the Canon all through are but particular portions of the æra of Nabonassar. The Canon has no use, nor value, *per se;* nor in fact any meaning or signification apart from the æra of Nabonassar. The ultimate standard of reference in all these cases is the æra of Nabonassar: and that is so well understood, that there never can be any ambiguity about it.

Again; these Babylonian eclipses of the Magna Compositio are all dated in terms of the Egyptian Calendar; though we have supposed that they were all observed and recorded at Babylon. Yet this need not render them the less certain, nor cast any doubt on their authenticity; because I can undertake to say, that neither when these eclipses began to be recorded at Babylon, nor when the last of them was recorded, was there any difference between the Babylonian Calendar and the Egyptian, except one which was purely accidental and purely immaterial: viz., that the Egyptian Calendar had proper names for the months, and the Babylonian Calendar had not. The rule of all antiquity every where at first appears to have been, to distinguish the months of the civil calendar by number and order only. The Egyptian Calendar was no exception to this rule at first. The Egyptian Calendar itself had no proper names for its months, before the epoch of the Sothiacal period. The Babylonian Calendar was no exception to it B. C. 721, nor even B. C. 382. It is a great mistake to suppose that the names of the months in the lunar calendar of the Jews, which begin to appear in Scripture first after the return from captivity, and are still in use at the present day, were borrowed from the Babylonians; and not imposed by the Jews on their own calendar for themselves. In the Magna Compositio, we do not meet with the name of a single Babylonian month. The names of the months in their solar calendar are borrowed from the Egyptian; those of the months in their lunar, mentioned by Ptolemy at least, are the Macedonian: — which could not have been adopted at Babylon before the time of Alexander and his successors. It is to be presumed, then, that Hipparchus in the first place, and Ptolemy in the next, transferred the names of the Egyptian months to the Babylonian, merely for the sake of convenience. And no one can doubt that, if the two calendars were really the same in all other respects, they would clearly be at liberty to do this; and what is more, that it would be desirable to do it, and that it would serve as the means of reducing the dates of one of these calendars to the corresponding terms in the other, without any trouble, from the first.

*Egyptian or Babylonian Calendar*, B. C. 721, *to* B. C. 382.

| MONTHS. | | | DAYS. | MONTHS. | | | DAYS. |
|---|---|---|---|---|---|---|---|
| i | *Θωΰθ. Θώθ* | Thoth. | 30 | vii | *Φαμενώθ.* | Phamenoth. | 30 |
| ii | *Φαωφί.* | Phaophi. | 30 | viii | *Φαρμουθί.* | Pharmuthi. | 30 |
| iii | *Ἀθύρ.* | Athyr. | 30 | ix | *Παχών.* | Pachon. | 30 |
| iv | *Χοιάκ.* | Chœac. | 30 | x | *Παυνί.* | Paüni. | 30 |
| v | *Τυβί.* | Tybi. | 30 | xi | *Ἐπιφί.* | Epiphi. | 30 |
| vi | *Μεχείρ.* | Mechir. | 30 | xii | *Μεσορῆ.* | Mesore. | 30 |
| | | | Sum 180 | | | | Sum 180 |

xiiith or imperfect month, of 5 days. *Ἐπαγόμεναι ἡμέραι.*

Again; these lunar eclipses seem to have been all recorded at Babylon in apparent, variable, or *kæric* time; which Ptolemy reduces to mean or equinoctial time, first, for the meridian of Babylon, and then, for that of Alexandria in Egypt. He could not want the means of doing either of these things. The latitude of the ancient Babylon, the length of the longest or the shortest day there at least, was probably better known to the ancients, than it is to ourselves at present. As a proof of the accuracy of Ptolemy's reductions; he assumes fifty minutes of mean time between the meridian of Alexandria and that of Babylon; which every one must allow to be substantially correct. In D'Anville's map of the ancient world, Alexandria is laid down in 47° or 48°; Babylon in 61° or 62°: the difference of which is 14° or 15° = 56 or 60 minutes in time.

Again; it is to be particularly observed that each of these eclipses in the Compositio appears to have a double and so far an ambiguous date; yet, when the reason of this peculiarity is explained, neither will that circumstance be allowed to cast a doubt upon them.

The tables of Ptolemy and the dates of Ptolemy are all deduced from one and the same point of time; the first year of the æra of Nabonassar, and the first day of that year, the first of the Egyptian or the Babylonian Thoth; but from the first of this month at noon, or according to the Julian reckoning, at twelve hours from midnight. And the nightday of Ptolemy, or cyclical period of twenty-four hours of mean time, beginning at this epoch, is reckoned from noon to noon perpetually. Now the common or popular reckoning of the nightday in all antiquity, and among both Greeks and barbarians, was originally one and the same; and agreeable to one simple and primitive and invariable rule: viz., from sunset to sunset, at all seasons of the year alike. This is eminently true of the Egyptians; among whom this simple and primitive rule, as far as I have been able to discover, was never superseded by any other, from first to last. It was equally characteristic of the Greeks, both in the mother country and abroad, in Hipparchus' and Ptolemy's time. Yet Hipparchus adopted a different rule; that of reckoning his nightday from midnight to midnight; for such appears to have been *his* rule in general, though not invariably so. Ptolemy also adopted a different rule: that of reckoning his nightday from noon to noon: though he too sometimes employs the popular mode of reckoning it notwithstanding.

Now the first year of the æra of Nabonassar, in the proleptical Julian year, bearing date B.C. 747; by the common or popular rule, the first of Thoth that year in Egypt or in Chaldæa, bore date February 25, at sunset, by Ptolemy's peculiar rule, February 26, at noon; which by the popular reckoning was Thoth 1, at eighteen hours from sunset. There was therefore from the first, a standing difference of eighteen hours between Ptolemy's epoch of the nightday, and the popular one: every nightday of Ptolemy's, consequently, must begin eighteen hours later than the corresponding popular one: and there could be only six hours, in the course of a given nightday, common to both; the first six hours of one of his, and the last six hours of the corresponding popular one.

Ptolemy has pointed out this distinction by the use of a particular idiom, which occurs repeatedly in the Compositio, and yet has been mistaken by chronologers of great reputation; an instance of which will be the date assigned to the first of the eclipses in question: *Θὼθ κθ′ εἰς τὴν λ′*. There is an ellipsis here; which, it appears from the comparison of parallel phrases, is *φερούσῃ*: so that the date fully exprest would be *Θὼθ κθ′ τῇ φερούσῃ εἰς τὴν λ′*. The meaning is, the 29th of Thoth, at such a time, supposed to anticipate on the 30th: the 29th of Thoth by Ptolemy's reckoning, the 30th, by the popular. For after what has been said, it will easily be understood, that Ptolemy's 29th of Thoth, reckoned *from noon,* begins at the nineteenth hour of the 29th Thoth, reckoned *from sunset:* and Ptolemy's 29th of Thoth, reckoned *to noon* also, ends with the eighteenth hour of the 30th Thoth, reckoned *from sunset.* It follows too from this difference of rule, that there could be only one case in which a date of Ptolemy's reckoned from noon, and the corresponding popular one, could agree; viz., a date which fell between *noon* and *sunset.* If any one will examine the Compositio, with a particular attention to the use of this idiom throughout, he will soon be satisfied that it never occurs in dates of this description; but only when the dates in question fall between sunset on one day and noon on the next; as those of all the lunar eclipses about to be noticed do. It should be remembered, then, that the proper date of each of these eclipses, according to Ptolemy, is always the first of these double dates; such a day of the month, at so many hours from noon: the second is this proper date reduced to the vulgar or popular; the next higher day of the month, at the same number of hours, *minus* the difference in hours between noon and sunset; which of course is always *six.*

The drift of these remarks is to suggest the inference, that having had a circumstantial description of these ten lunar eclipses in particular, handed down to us with so much precision, and on such good authority; we may fairly and reasonably conclude that we know them even now, at this distance of time, exactly as they were observed, and as they were recorded at Babylon; exactly as they appeared to the eye-witnesses of these phenomena at the time: and therefore, though modern astronomers have repeatedly put these recorded dates to the test of their own calculations, and have always found more or less of difference between such calculations and these dates, that ought not to make us sceptical about the fact of the observations at the time, nor distrustful of the accuracy of the accounts which have been transmitted by testimony concerning them; but rather of the truth of the results of calculation, so far as they differ from these accounts: for in a case of this kind, it must be safer to rely on contemporary testimony to the actual matter of fact, than on any calculation of the same thing, the data of which can never be absolutely taken for granted.

# SECTION II.

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## *Descriptions and dates of the Lunar Eclipses, observed at Babylon, from* B. C. 721, *to* B. C. 382, *and recorded in the Magna Compositio.*

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I. Magna Compositio, Lib. iv. cap. v. p. 244. (Cf. Lib. iv. cap. vi. 263; cap. vii. 264; cap. viii. 269: Lib. vi. cap. ix. 433).

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Canon of Kings, 1st year of Mardoc-Empadus. Æra of Nabonassar, 27.

---

*Θὼθ κθ′ εἰς τὴν λ′.*

---

*Ἤρξατο δὲ, φησὶ,* (sc. Hipparchus) *ἐκλείπειν μετὰ τὴν ἀνατολὴν, μιᾶς ὥρας ἱκανῶς παρελθούσης, καὶ ἐξέλιπεν ὅλη.*

---

| | H. | M. | |
|---|---|---|---|
| Beginning, mean time, | 4 | 30 | before midnight. |
| Middle, — | 2 | 30 | before midnight. |

---

| | D. | H. | M. | | D. | H. | M. |
|---|---|---|---|---|---|---|---|
| Nabonassar 27. Thoth | 1 | 0 | 0 | B.C. 721. Feb. | 20 | 12 | 0 |
| Add | 28 | 9 | 30 | Add | 28 | 9 | 30 |
| From noon, Thoth | 29 | 9 | 30 | March | 19 | 21 | 30 |
| From sunset, — | 30 | 3 | 30 | | | | |

II. Canon of Kings, 2nd year of Mardoc-Empadus. Æra of Nabonassar, 28.

*Θὼθ ιή εἰς τὴν ιθ΄.*

*Ἐξέλιπε δὲ, φησὶν, ἀπὸ νότου, δακτύλους τρεῖς, αὐτοῦ τοῦ μεσονυκτίου.*

Middle, midnight, Thoth 18 at 12h.

| | D. | H. | M. | | D. | H. |
|---|---|---|---|---|---|---|
| Nabonassar 28. Thoth | 1 | 0 | 0 | B.C. 720. Feb. | 19 | 12 |
| Add | 17 | 12 | 0 | Add | 17 | 12 |
| From noon, Thoth | 18 | 12 | 0 | March | 9 | 0 |
| From sunset, — | 19 | 6 | 0 | | | |

III. Canon of Kings, 2nd year of Mardoc-Empadus. Æra of Nabonassar, 28.

*Φαμενὼθ ιέ εἰς τὴν ις΄.*

A second eclipse the same year.

*Ἤρξατο δὲ, φησὶν, ἐκλείπειν μετὰ τὴν ἀνατολὴν, καὶ ἐξέλιπεν ἀπ' ἄρκτων πλεῖον τοῦ ἡμίσους.*

| | H. | M. | |
|---|---|---|---|
| Beginning, | 5 | 0 | before midnight. |
| Middle, | 3 | 30 | before midnight. |

| | D. | H. | M. | | D. | H. | M. |
|---|---|---|---|---|---|---|---|
| Nabonassar 28. Thoth | 1 | 0 | 0 | B.C. 720. Feb. | 19 | 12 | 0 |
| Add | 194 | 8 | 30 | Add | 194 | 8 | 30 |
| From noon, Phamenoth | 15 | 8 | 30 | Sep. | 1 | 20 | 30 |
| From sunset, — | 16 | 2 | 30 | | | | |

## IV. Magna Compositio, Lib. v. cap. xiv. p. 340.

Canon of Kings, 5th year of Nabopolassar. Æra of Nabonassar, 127.

*Ἀθὺρ κζ′ εἰς τὴν κή.*

*Ὥρας ιά ληγούσης ἤρξατο ἡ σελήνη ἐκλείπειν, καὶ ἐξέλιπε τὸ πλεῖστον ἀπὸ νότου δ′ τῆς διαμέτρου;* that is, as Ptolemy explains it directly after, *μετὰ έ ὥρας τοῦ μεσονυκτίου καιρικάς*—which proves that *ὥρας ιά ληγούσης* just before is meant of the popular reckoning, Athyr 28, at 11 kæric hours from sunset.

Middle, 5h. 50m. after midnight.

| | D. | H. | M. | | D. | H. | M. |
|---|---|---|---|---|---|---|---|
| Nabonassar 127. Thoth | 1 | 0 | 0 | B.C. 621. Jan. | 26 | 12 | 0 |
| Add | 86 | 17 | 50 | Add | 86 | 17 | 50 |
| From noon, Athyr | 27 | 17 | 50 | April | 22 | 5 | 50 |
| From sunset, — | 28 | 11 | 50 | | | | |

V. Magna Compositio, *Loc. cit.*

Canon of Kings, 7th of Cambyses. Æra of Nabonassar, 225.

*Φαμενὼθ ιζʹ εἰς τὴν ιή, πρὸ μιᾶς ὥρας τοῦ μεσονυκτίου, ἐν Βαβυλῶνι ἐξέλιπεν ἡ σελήνη ἀπ᾽ ἄρκτου τὸ ἥμισυ τῆς διαμέτρου.*

Middle, 1h. before midnight.

| | D. | H. | M. | | D. | H. | M. |
|---|---|---|---|---|---|---|---|
| Nabonassar 225. Thoth | 1 | 0 | 0 | B.C. 523. Jan. | 1 | 12 | 0 |
| Add | 196 | 11 | 0 | Add | 196 | 11 | 0 |
| From noon, Phamenoth | 17 | 11 | 0 | July | 16 | 23 | 0 |
| From sunset, — | 18 | 5 | 0 | | | | |

VI. Magna Compositio, Lib. iv. cap. viii. 269, 270.

Canon of Kings, 20th of Darius, Hystaspis Fil. Æra of Nabonassar, 246.

Lunar Eclipse — *᾽Επιφὶ κή εἰς τὴν κθʹ, τῆς νυκτὸς προελθούσης ἰσημερινὰς ὥρας ϛʹ γʹʹ* (6h. and 20m.) — or, as Ptolemy computes for Babylon, 24m. before midnight, 11h. 36m. from noon, Epiphi 28: *καθ᾽ ἣν ὁμοίως ἐξέλιπεν ἡ σελήνη ἀπὸ νότου τὸ δʹ τῆς διαμέτρου.*

| | D. | H. | M. | | D. | H. | M. |
|---|---|---|---|---|---|---|---|
| Nabonassar 246. Thoth | 1 | 0 | 0 | B.C. 503. Dec. | 27 | 12 | 0 |
| Add | 327 | 11 | 36 | Add | 327 | 11 | 36 |
| From noon, Epiphi | 28 | 11 | 36 | B.C. 502. Nov. | 19 | 23 | 36 |
| From sunset, — | 29 | 5 | 36 | | | | |

## VII. Magna Compositio, Lib. cit. p. 267, 268.

Canon of Kings, 31st of Darius the First, (Hystaspis.) Æra of Nabonassar, 257.

*Ἔκλειψις σελήνης—τετηρημένη ἐν Βαβυλῶνι ... κατ’ Αἰγυπτίους Τυβὶ γ′ εἰς τὴν δ′, ὥρας ς′ μέσης*—(that is, in the popular reckoning, half an hour before midnight: Ptolemy is quoting from Hipparchus:)—*καθ’ ἣν διασαφεῖται ὅτι ἐξέλειπεν ἡ σελήνη ἀπὸ νότου δακτύλους β′.*

*Πρὸ ἡμιωρίου τοῦ μεσονυκτίου.*

| | D. | H. | M. | | D. | H. | M. |
|---|---|---|---|---|---|---|---|
| Nabonassar 257. Thoth | 1 | 0 | 0 | B.C. 492. Dec. | 24 | 12 | 0 |
| Add | 122 | 11 | 30 | Add | 122 | 11 | 30 |
| From noon, Tybi | 3 | 11 | 30 | B.C. 491. April | 25 | 23 | 30 |
| From sunset, — | 4 | 5 | 30 | | | | |

## VIII. IX. X. Magna Compositio: Lib. iv. cap. x. 274-278.

These three eclipses are later than all the preceding; and were dated by Hipparchus in the years of the Athenian Archons, as well as in the æra of Nabonassar: which only adds another to the circumstantial criteria of their authenticity at present.

i. *Γεγονέναι δέ* (*φησι*) *τὴν πρώτην*, says Ptolemy, *ἄρχοντος Ἀθήνησι Φανοστράτου, μηνὸς Ποσειδεῶνος, καὶ ἐκλελοιπέναι τὴν σελήνην βραχὺ μέρος τοῦ κύκλου ἀπὸ θερινῆς ἀνατολῆς* (the point in the heavens, at Babylon, where the sun was usually seen to rise at the summer solstice) *τῆς νυκτὸς λοιποῦ ὄντος ἡμιωρίου· καὶ ἔτι, φησὶν, ἐκλείπουσα ἔδυ.* The proper Babylonian date, however, was specified also; Nabonassar 366: *κατ' Αἰγυπτίους δὲ.... Θὼθ κς' εἰς τὴν κζ', μετὰ ἑ ς''* (5½) *ὥρας καιρικὰς τοῦ μεσονυκτίου, ἐπειδήπερ λοιπὸν ἦν τῆς νυκτὸς ἡμιώριον.*

| | | D. | H. | M. |
|---|---|---|---|---|
| Beginning, | Thoth | 26 | 18 | 36 |
| Middle, | Thoth | 26 | 19 | 20 |

| | D. | H. | M. | | D. | H. | M. |
|---|---|---|---|---|---|---|---|
| Nabonassar 366. Thoth | 1 | 0 | 0 | B.C. 383. Nov. | 27 | 12 | 0 |
| Add | 25 | 19 | 20 | Add | 25 | 19 | 20 |
| From noon, Thoth | 26 | 19 | 20 | Dec. | 23 | 7 | 20 |
| From sunset, — | 27 | 13 | 20 | | | | |

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ii. *Πάλιν τὴν ἑξῆς ἔκλειψίν φησι γεγονέναι ἄρχοντος Ἀθήνησι Φανοστράτου, Σκιροφοριῶνος μηνὸς, κατ' Αἰγυπτίους δὲ Φαμενὼθ κδ' εἰς τὴν κέ. ἐξέλιπε δὲ, φησὶν, ἀπὸ θερινῆς* (quære *χειμερινῆς*?) *ἀνατολῆς, τῆς πρώτης ὥρας προεληλυθυίας.* This was a second eclipse, Nab. 366: and it lasted three hours.

| | | D. | H. | M. |
|---|---|---|---|---|
| Beginning, | Phamenoth | 24 | 7 | 36 |
| Middle | — | 24 | 9 | 6 |

| | D. | H. | M. | | D. | H | M. |
|---|---|---|---|---|---|---|---|
| Nabonassar 366. Thoth | 1 | 0 | 0 | B.C. 383. Nov. | 27 | 12 | 0 |
| Add | 203 | 9 | 6 | Add | 203 | 9 | 6 |
| From noon, Phamenoth | 24 | 9 | 6 | B.C. 382. June | 18 | 21 | 6 |
| From sunset, — | 25 | 3 | 6 | | | | |

iii. *Τὴν δὲ τρίτην φησὶ γεγονέναι ἄρχοντος Ἀθήνησιν Εὐάνδρου, μηνὸς Ποσειδεῶνος τοῦ προτέρου, κατ' Αἰγυπτίους Θὼθ ις' εἰς τὴν ιζ'. ἐξέλιπε δὲ, φησὶν, ὅλη, ἀρξαμένη ἀπὸ θερινῶν ἀνατολῶν, δ' ὡρῶν παρεληλυθυιῶν.* This was an eclipse the next year, Nab. 367: and it lasted four hours.

| | D. | H. | M. |
|---|---|---|---|
| Beginning, Thoth | 16 | 9 | 0 |
| Middle, — | 16 | 11 | 0 |

| | D. | H. | M. |
|---|---|---|---|
| Nabonassar 367. Thoth | 1 | 0 | 0 |
| Add | 15 | 11 | 0 |
| From noon, Thoth | 16 | 11 | 0 |
| From sunset, — | 17 | 5 | 0 |

| | D. | H. | M. |
|---|---|---|---|
| B.C. 382. Nov. | 27 | 12 | 0 |
| Add | 15 | 11 | 0 |
| Dec. | 12 | 23 | 0 |

## TABULAR VIEW OF THE TEN LUNAR ECLIPSES,

### RECORDED AT BABYLON, B. C. 721 to B. C. 382;

With their dates, according to Ptolemy, at Babylon, from observation, and according to Pingre, at Paris, by calculation.

| | PTOLEMY. | | | | | | | | | | PINGRE. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NABON. | | | | | B. C. | | | | | | | | |
| | — | | D. | H. | M. | — | | D. | H. | M. | | D. | H. | M. |
| i. | 27 | Thoth ...... | 29 | 9 | 30 | 721 | March. | 19 | 21 | 30 | March. | 19 | 20 | 0 |
| ii. | 28 | Thoth ...... | 18 | 12 | 0 | 720 | March. | 9 | 0 | 0 | March. | 8 | 22 | 0 |
| iii. | 28 | Phamenoth. | 15 | 8 | 30 | 720 | Sept... | 1 | 20 | 30 | Sept... | 1 | 19 | 30 |
| iv. | 127 | Athyr ...... | 27 | 17 | 50 | 621 | April.. | 22 | 5 | 50 | April.. | 22 | 2 | 45 |
| v. | 225 | Phamenoth. | 17 | 11 | 0 | 523 | July ... | 16 | 23 | 0 | July... | 16 | 21 | 30 |
| vi. | 246 | Epiphi ...... | 28 | 11 | 36 | 502 | Nov.... | 19 | 23 | 36 | Nov.... | 19 | 22 | 0 |
| vii. | 257 | Tybi ......... | 3 | 11 | 30 | 491 | April.. | 25 | 23 | 30 | April.. | 25 | 20 | 45 |
| viii. | 366 | Thoth ...... | 26 | 19 | 20 | 383 | Dec.... | 23 | 7 | 20 | Dec.... | 23 | 5 | 45 |
| ix. | 366 | Phamenoth. | 24 | 9 | 6 | 382 | June... | 18 | 21 | 6 | June .. | 18 | 18 | 45 |
| x. | 367 | Thoth ...... | 16 | 11 | 0 | 382 | Dec.... | 12 | 23 | 0 | Dec.... | 12 | 21 | 30 |

# CHAPTER II.

## SECTION I.

### ON THE ACCOUNT OF THE TWO MIRACLES, IN THE TIME OF JOSHUA, AND IN THE TIME OF HEZEKIAH, RESPECTIVELY.

I DO not hesitate to declare, (whatever be the kind or degree of difficulty, seeming or real, which may stand in the way of the reception of such a declaration,) that the two miracles, in the time of Joshua, and in the time of Hezekiah, respectively, according to the simple grammatical sense and construction of the scriptural account of each, are to be believed and acknowledged as actual matters of fact; and that, too, not merely because of the deference due to the testimony of Scripture itself, which ought to be above all doubt or contradiction, but from the necessity of the case; and because neither of these facts can be denied without a palpable absurdity, and without denying the actual state of things at present. Neither of these miracles can be dispensed with in its proper order of time, if we would account even for the actual state of things at present. Each has left an impression on the measures of time, which never has been, and never can be effaced. There is not one of these measures, natural or civil, which would be what it is at present, if nothing of the kind had ever happened. In one word, whether divines and commentators, or astronomers and men of science, have been able to read this truth on the pages of Scripture, where it was always so plainly and so easily to be read, or not; each of these miracles has been a consummated fact for more than 2500 years; and each must continue to be a consummated fact, and to produce its necessary effect as such a fact, to the end of time itself.

In like manner, I do not scruple to declare that the only simple, consistent, and unsophisticated construction of the scriptural account of these two facts is *this:* That on two several occasions, once in the time of Joshua, and again in the time of Hezekiah, an addition of twelve hours of mean time was made to the length of the natural day; not a seeming addition of any kind or in any sense, but a real *bona fide* addition; so that by virtue of such an addition, it twice came to pass, that one and the same natural day, instead of consisting of twelve hours of mean time only, consisted of twenty-four; or, to speak more correctly, that one and the same revolution of the earth about itself, instead of being performed in twenty-four hours of mean time, was performed in thirty-six.

The dates of these two miraculous facts might be a distinct question. The facts would not be less real, nor the consequences of those facts less permanent or indisputable, because we could not determine with certainty the times when they must have happened. Yet the dates of them both, after all, do admit of being determined. Scripture itself supplies every thing necessary for that purpose, if we only know how to use it rightly: and I think that there are proofs to be produced from Scripture, if it were necessary, which could leave no doubt that the actual date of the first of these two miracles, was May 31, B.C. 1520, and that of the second, May 31, B.C. 710.

In my opinion too, we are not more free to doubt of the mode in which each of these miraculous effects must have been brought about, than of the truth of the facts themselves; though the fact of a particular operation and the mode of the operation itself, are not necessarily connected; and there are various conceivable circumstances, under which even two such miraculous facts as these, might be supposed to have been differently brought to pass. But Scripture itself declares, that on the first of these occasions, the sun was commanded to stand still, and the sun did stand still;—from which it follows, that the motion of the earth about its axis must have been stopped, or suspended; since this only could have produced such a phenomenon as that. The mode, therefore, in which the first of these miraculous effects was brought about, must have been the actual suspension of the motion of the earth about itself. On the second occasion, Scripture declares, that it was required the sun should go back in the heavens;—and that the sun did actually go back: from which the inference appears to me to be equally necessary, that on this second occasion the motion of the earth about itself could not have been stopped, as before, but must have been reversed, or turned in the opposite direction—in the first place at least, and until that retrograde movement of the sun in the heavens had taken effect. The *modus operandi*, therefore, in the first of these miraculous processes, was the absolute suspension of the motion of the earth about itself; that in the second, was the actual reversion of this motion, and the communication of another in the opposite direction in the first instance at least: and it may go some way to explain this distinction, and to make a difference in the mode of the operation, even when the effect was designed to be the same, on two different occasions, reasonable and consistent even to our own apprehensions, to know, that when the first of these miraculous effects began to be contemplated, the sun was just on the verge of the horizon in the east, at the beginning of the natural day; and when the second, in like manner, had to be provided for, the sun was not far from the horizon in the west, nor was it long before the close of the natural day. To keep the sun, a certain length of time, in the same position on the horizon in the east, on the former occasion, would require the cessation of the motion of the earth about itself for that length of time also: and to replace the sun in the horizon in the east, on the second occasion, from the position which it was occupying previously in the west, would require the motion of the earth about itself to be reversed—not stopped or suspended—on that.

It would not be practicable, however, for me to enter at present on the consideration of each of these miracles, with a view to every objection, and to every difficulty, which might appear to be connected with the simple, unhesitating, and unqualified admission of each. Most indeed of these objections and difficulties, especially those which might be derived from the contemplation of possible physical consequences on two such extraordinary events, as the cessation of the motion of the earth about itself, or the reversion of the motion of the earth about itself, would be absolutely nugatory — absolutely imaginary — and, unless the truth of the facts themselves could be denied or disproved, would be contradicted and confuted by the event itself: for it is certain, that even though two such miraculous departures from the usual course of nature actually did take place some time or other, no such consequences could ever have resulted from them; and so far they might never have taken place at all, and every thing might have gone on just the same as usual, before and after. And as to objections of any other kind, I much doubt whether any thing could reasonably be urged against the credibility of even two such miraculous facts as these, *a priori*, which might not be objected, with just as much reason, to that of any miracle whatever.

The truth is, these two miracles were closely connected together; and it is not too much to say, that the former having been permitted, the latter must some time or other be permitted also. The second miracle was supplementary to the former. The former miracle caused an interruption in the relations of the measures of time one to another; particularly those of the cycle of day and night;

which could not be rectified without the intervention of the same thing a second time: and knowing what the effect of the first miracle, in that respect, had been, we might almost without presumption have ventured to predict that, at some proper time or other, it would be repeated in the second.

Now there is this difference, perceptible even in the Scripture account of the origin or moving cause of these two miracles themselves, respectively; that the first of them is attributed to Joshua — the second is not attributed to Hezekiah. Joshua may be said to have acted from an impulse of his own, on the former occasion; but Hezekiah cannot be said to have done so, on the latter: for every one, who has read the Scripture account of the second miracle, must know, that though Hezekiah might have asked for a sign, he could not have asked for such a sign as this, until it was proposed to him. It does not appear that he either contemplated or expected any such sign as this, until he had been empowered to ask for it. In one sense, then, and humanly speaking, the first miracle may be said to have been accidental; but the second can in no sense be said to have been so: the best explanation of which distinction is, that the first miracle having once come to pass, a second miracle of the same kind was necessary to its complete and full effect: so that this second miracle was both supplementary and complementary to the first; and they ought not to be regarded as distinct and independent events of a particular kind respectively, but as one and the same effect, completed at two different times. The juncture of time, selected for this supplementary miracle, was that of the sickness of Hezekiah; whereby it became equally well calculated to answer the purpose of a sign to him, in confirmation of the special providence of which he had just been assured in his own behalf, (by the promise of his recovery, and of the addition of fifteen years more to the length of his life,) while it was fulfilling this necessary purpose also — so indispensable to the restoration of the original relations of the measures of time one to another; more especially those of the mean and of the actual cycle of day and night, and of both as referred alike to the course and succession of the hebdomadal cycle.

## SECTION II.

### *On the effect of the two miracles in question upon each of the measures of time.*

There are no real distinctions in the natural measures of time, nor consequently in the civil, which have been every where substituted to the natural, except these four; the cycle of night and day; the cycle of weeks; the cycle of years; and the cycle of months. Let us briefly consider the kind and degree of the effect, which would necessarily be produced on each of these, by two such matters of fact, as those of the miracles, for which we are at present contending.

I. With regard to the cycle of night and day: The mean cycle of night and day, and the actual cycle of night and day, *de facto* and at a given time may not be different: but in theory they must be regarded as distinct. The mean cycle of night and day is the numerical succession of one and the same period of twenty-four hours of mean time, from its proper beginning, continually: the actual cycle of night and day is the numerical succession of actual revolutions of the earth about itself, from first to last. It was the law of this measure from the first, that the mean cycle in this sense, and the actual in the corresponding sense, should be the same; that both should proceed from, and both should return to, the same point alike, and in the same interval of time, perpetually. Nor is there any reason to suppose, that up to the date of the first of these miracles, this proportion of the two cycles, one to the other, was ever disturbed: but at the date of the first of these miracles, it could not fail to be disturbed. The actual cycle of night and day would not be interrupted; and the mean cycle of night and day, in the sense explained above, would not be interrupted: but the proportion of one to the other, from that time forward, would necessarily be interrupted. Some one numerical actual cycle would contain thirty-six hours of mean time, while the numerical mean cycle, which began with that, would contain only twenty-four. The epoch of every numerical actual cycle would continue the same; and if it was to be dated from sunset, before the time of the miracle, it must still be dated from sunset after it: but the epoch of every mean cycle could not continue the same; and if it was sunset, before the occurrence of such an interruption as this, it must be sunrise in consequence of it, for a time at least, if not for ever after. And it is manifest, that the first and direct effect which had been produced on each of these cycles, one in relation to the other, by the first of the miracles, B.C. 1520, *mutatis mutandis,* would be repeated B.C. 710: but the ultimate consequence of the repetition at that time, would be, to restore the proportion of the two cycles one to the other, which had been disturbed by the first occurrence of the same kind. The epoch of the mean cycle, by that second interruption, would again be brought to a par with that of the actual; and the two cycles would again be in a condition to begin and proceed together, from that time forward, exactly as they had done at first. But on this principle, some *two* numerical mean cycles must have been absorbed in *one* actual cycle; or what comes to the same thing, some one numerical cycle of actual day and night must have contained forty-eight hours of mean time, instead of twenty-four.

II. With regard to the cycle of weeks, or the Hebdomadal Cycle: The hebdomadal cycle is a particular form of the cycle of night and day. It is the constant succession of night and day by periods of seven at a time. And the order of such succession is called by chronologers the order of *feriæ*. Now as to the order of feriæ in this sense — that is, the actual succession of actual night and day, in the hebdomadal cycle — it never has been disturbed, not even by either of the miracles in question. The actual order of feriæ, and the actual succession of night and day, have neither of them varied from the first: and it is equally true to say, that there never has been a single numerical cycle of actual night and day, which has occupied any but its proper place in the order of feriæ, and that there never has been a single numerical cycle of the week, which has had either more or less than its proper complement of feriæ, and in their proper order of succession, one after another, from the first. The proper effect then of each of the miracles, on this measure of time in particular, is to be explained by that which they produced on the cycle of night and day. It is the law of the hebdomadal cycle to consist of seven cycles of night and day, perpetually; only after a certain order: and it makes no difference to the continuity of the hebdomadal succession, whether these cycles are the mean or the actual. So long as they are both the same, the succession will be carried on by both alike. If they begin to differ, the succession will still be carried on by the actual; but the number of hours of mean time in a given series of seven actual cycles, will vary to the extent of the difference, from the number in the corresponding series of mean. This, then, was the effect produced by each of the miracles in question, on the measure of time by weeks. The number of hours of mean time, contained in the week, as supposed to consist of seven actual cycles, and seven mean cycles of night and day, beginning and ending alike perpetually, can be neither more nor less than 168. On each of those two occasions, a certain numerical week, of no more than seven actual cycles of day and night, as usual, came to contain 180: or what amounts to the same thing—as soon as the effect of both the miracles was complete—one numerical week, or only seven cycles of night and day, came to contain 192 hours of mean time: neither the actual succession of night and day, nor the actual succession of feriæ, nor the actual cycle of the week itself, being disturbed thereby, notwithstanding.

III. With regard to the measure of time by years; Assuming that hereby we are to understand natural years, dated perpetually from some one of the cardinal points of the natural year, (as, for example, the Vernal Ingress,) to the same again, I have not been able to discover, that either the mean or the actual length of the year, in this sense, became any thing different from usual, in consequence of either of these miracles; either that of B.C. 1520, or that of B.C. 710: and though I speak with diffidence on this point, I am not aware of any reason *a priori*, from which, admitting the truth of each of those miraculous facts, in other respects, to the fullest extent, we should be led to expect that any such consequence as this in particular, would be found to have resulted from them: because, so far as I know at least, the length of the natural year depends upon the motion of the earth about the sun, and not on the motion of the earth about itself; and I am not cognizant of any physical necessity, which, unless purposely controlled by the will of the Deity, would require the motion of the earth about the sun to be altered in some way or other, because its motion about its own axis was suspended, or because the law of that motion *pro tempore* was changed.

I know of no reason, then, why the natural year, on each of these occasions, B.C. 1520 and B.C. 710, might not be expected to contain just the same number of mean days and nights, or to speak more correctly, of mean hours and their parts, as before and after; whatsoever that may be supposed to have been. But with regard to the proportion of this natural year to any such standard of measure as the civil, supposed to have accompanied it, and supposed to have been compared with it, from the first, before and after the times of these two miracles respectively—the case would be very different.

For, if we may assume that this civil year was the Julian, and that the mean standard of the Julian year is 365 days, 6 hours, of mean time perpetually; the difference between this, and the mean standard of the natural year which

I have adopted in my Tables, and which cannot be far from the truth, if it is not absolutely the standard of the truth, is 11m. 9sec. 36thds. annually;—and every four years, or every cycle of the leap year complete, it is 44m. 38sec. 24thds. Now, suppose an addition of twelve hours of mean time made *per saltum*, or all at once, to the mean standard of the Julian year, in B.C. 1520; yet no corresponding addition to the mean standard of the natural: it must necessarily happen that four years after, the anticipation of the natural on the Julian year, instead of continuing to be 44m. 38sec. 24thds. merely, would be found to have dropt *per saltum* to 12 hours, 44m. 38sec. 24thds: and the same effect on the relation of the natural to the Julian year, would be found to have been produced in four years' time, or to speak more truly, in one year's time—which in the ordinary course of things, and on the principles assumed in my Fasti in particular, it would have required fifty-six years at least to produce. The proportion between the two forms of the year, and with that, every thing dependent upon it, would consequently have to be readjusted so much sooner, than otherwise would have been the case. And the effect produced on this proportion by the first miracle, B.C 1520, would be repeated by the occurrence of the second, under precisely similar circumstances, B.C. 710: so that it would twice come to pass, as a necessary consequence of each of these miracles in its proper order of time, that a correction of the civil year, as supposed to represent the natural, and to accompany the natural, from the first, in order to restore and perpetuate the original relations of equality between them, would be rendered unavoidable in half the time, which would otherwise have been required for that purpose.

In order, however, that this reasoning may become clear and intelligible, it is necessary, at this stage of the argument, to enter on a more particular account of the System of Time which is laid down in my Tables; and of the principles on which it has been constructed: to which I shall therefore proceed; though I shall endeavour to be as brief as possible.

## SECTION III.

### *On the Fasti Catholici, or General Tables of Time; and the principles on which they are constructed.*

The first principle, then, assumed in this system is, That the ultimate standard and measure of the actual course and succession of annual time is the mean solar or tropical year; especially of that course and succession, as traced from the first, and without interruption, down to the present day.

In the next place, it is assumed in this system, though not without full and satisfactory assurance of the fact, that the absolute epoch of this equable and constant succession of annual time, was the point of the Vernal Equinox, B.C. 4004; in the natural year, April 24, the Feria Septima, 11m. 9sec. 36thds. before midnight; in the Julian year, April 25, the Feria Prima at midnight.

Thirdly, it is assumed in this system, that though under such circumstances, the true ultimate standard of reference to the actual succession of mean annual time from the first, must be the revolution of the natural year, from the point of the Vernal Ingress to the point of the Vernal Ingress perpetually; yet as, *de facto*, the measure of this succession has no where, nor at any period of the history of the world, (unless it be among the Hindoos, and from a comparatively recent date,) been the actual revolution of the natural year itself — but always and every where some positive standard or measure of the same kind, supposed to be equivalent to the natural, and purposely substituted for it: the system of time too, laid down in these Tables, must be conformed to the matter of fact in that respect also, as much as in any other; and the Tables must be constructed, from first to last, accordingly.

But with regard to the positive or conventional standard, which was thus to be substituted for the natural: I was well assured that there was one description of this civil or positive standard, which in point of antiquity was as old as the natural year itself, and had come into being along with the natural year, and had continued in being among mankind, every where and without exception, as the civil or calendar substitute of the natural year, down to a very late period of time, before it was superseded by any other, or modified in any way whatsoever, in comparison of its original simplicity; and that this was the equable year of 365 days of mean length, and no more; the nearest approach, in integral cycles of nights and days, to the actual length of the mean natural year, which in the nature of things was possible. And although I did not think it right to adopt even this, as the civil or conventional standard of the natural year, recognized in my Fasti from first to last; yet I thought it due to the matter of fact, and to the universality of this particular form of the civil year from the first, to incorporate it in the same system, and to bring it down in my Tables from first to last: by which means too, and which alone, I have been enabled to retain in my hands a constant and never-failing clue to every other description of calendar, which after a time came to be substituted even to this. For every thing else of that kind, which either did exist among mankind heretofore, or is actually in existence still, directly or indirectly is resolvable into this; and may both be shown to have branched off at a certain point of time from this Primitive Calendar of all antiquity, and may also be traced back to it, if necessary, even from the present day, and merged in it again at the same point of time.

The object proposed by my undertaking, however, being to exhibit an uniform and continuous representation of the course of time, in each of its measures, from first to last; it appeared to me that the question which I was thus considering, had been already decided by the matter of fact: and that whatsoever civil or conventional standard of the natural year I might have employed from the first, yet when I came down to the epoch of the Gregorian correction, or even to that of the Julian, it must be laid aside for the Julian or Gregorian: it must be assimilated to the Julian or the Gregorian at last. I came therefore to the conclusion that the civil or positive type of the natural year, which it was proper, or rather necessary, for me to employ from the first, must be the Julian or the Gregorian, at present in use; or something analogous to the Julian or the Gregorian, at present in use, if not absolutely the same with either, at least from the first.

I say something analogous to the actual Julian, or the actual Gregorian year, at present in use, though not absolutely the same with either, from the first: for it is to be considered that the Gregorian correction had no actual existence before A.D. 1582; nor the Julian, in its present form, wherever it is still in use, as I have been enabled to discover, in reality before A.D. 225; and even at the earliest possible date, not before B.C. 45. And this being the case, to have carried back the simple Gregorian year, or the simple Julian year, from the present day, to the beginning of things, and to have substituted it for the natural year, as the fixed and invariable standard of the actual succession of annual time from the first; might easily indeed have been done, but as it appeared to me, was not to be hastily resolved on; nor until every precaution had been taken, by the application of the proper tests and criteria of truth, to discover how far two such different systems as the natural year, and a perpetual type or standard of that year, of this description, were adapted to harmonize with each other, and to work together in conjunction from first to last.

Now the only test or criterion of truth, which in the nature of things could possibly be applied in a case of this kind, and yet a sufficient and an infallible criterion too; was the hebdomadal cycle, or the constant succession of night and day in the order of feriæ perpetually. The succession of night and day never having varied from the first, it must or it ought to be the same, both in the natural and in the civil year, perpetually: and the order of feriæ in the hebdomadal cycle never having varied from the first, it must or it ought to be the same both in the civil and in the natural year, as referrible to it alike perpetually

Having given then the epoch of the hebdomadal cycle, or of the true course and succession of the nocti-diurnal cycle in the order of feriæ perpetually; and having given also the epoch of the course and succession of annual time both in the natural and in the Julian year; it is very easy for any one to draw out the scheme of the succession of the nocti-diurnal cycle, both in the natural and in the Julian year, in the order of feriæ, as supposed to be fixed and invariable, for any length of time that he may choose: and I have myself delineated such a scheme, which extends from B.C. 4004 to A.D. 1997. All that it is necessary to bear in mind, when setting about the construction of such a scheme in the first instance, is this; That the nocti-diurnal epoch in the natural year, and the nocti-diurnal epoch in the civil, are not, and in the nature of things cannot be, the same; but that whatsoever point of time is assumed as the epoch of this cycle in the Julian year, a point of time twenty-four hours of mean length earlier than that, is or ought to be assumed as its epoch in the natural: for instance, if the former is assumed to be April 25, the *feria prima*, at midnight, the latter ought to be assumed as April 24, the *feria septima*, at midnight.

The reason of this is, that there is properly no leap year in the natural year; yet there is an annual epact, which accumulates, or may be supposed to do so, to a night and a day complete, every four years: and there is no epact, properly speaking, in the Julian year; yet there is a leap day, which is taken into account once for all every four years. Now no fractions of a day can be taken into account in the natural year, no more than in the civil, until they amount to an entire day: and then too, they must be taken into account at once, in the natural, as much as in the civil. The head of the civil year, however, once fixed, necessarily remains fixed ever after: the fraction of a day and a night, at the end of the natural year, is perpetually advancing the head of the natural by a constant quantity every four years at least in sequence. The periodic restitution, then, of the cycle of night and day even in the natural year, as proceeding all along conjointly with the Julian, is the work of a cycle of four years: and the natural epoch of the nocti-diurnal cycle in the former, as compared with the latter perpetually, is the point of time from which the epact begins to accumulate to twenty-four hours complete: and there must always be left a reserved night-day,— a margin of twenty-four hours — between the nocti-diurnal epoch in the natural year, and the nocti-diurnal epoch in the Julian; a night-day which shall always be the 366th in order, from the first actual cycle of the kind, in the natural year, to the same again; but which, for every three years in order, must be reckoned as the first cycle of that description in the natural year, and at the end of every fourth, as the last.

The nocti-diurnal epoch, then, in the natural year, being fixed to the feria septima at midnight, and the nocti-diurnal epoch in the Julian, to the feria prima at midnight; it may be assumed That so long as the difference between the natural and the Julian year, (by which I mean the anticipation of the former on the latter,) does not yet amount to a day and a night complete, the former will continue attached to the feria septima at midnight, as much as the latter to the feria prima at midnight: but when this difference has accumulated to a day and a night complete, then this can be, or ought to be, no longer assumed; but the real state of the case is then to be taken strictly into account: viz., that the head of the natural year, and with it the absolute epoch of the nocti-diurnal cycle in that year, has been all this time falling back in the order of the hebdomadal cycle, or order of feriæ, supposed to have been all along one and the same; and has now got from the feria septima at midnight, to the feria sexta at midnight; while in the Julian year, it has been, and still is, stationary at the feria prima at midnight. It is self evident, then, that at this point of time, the epoch of the nocti-diurnal cycle in the Julian year must be *shifted* or *set back*, from the feria prima at midnight, to the feria sexta at midnight: which being done, the relation of the two cycles and of the two epochs, one to another, in the common order of feriæ, will be restored; and every thing will be ready to begin and proceed as before: the nocti-diurnal cycle in the Julian year, from the feria sexta at midnight, and that in the natural, for the same reason as before, from the feria quinta at midnight, twenty-four hours of mean time before the other.

Now, in the simple Julian, or in the simple Gregorian year, this never could be permitted. The nocti-diurnal epoch once attached to the feria prima at midnight; periodically at least, that is, with every cycle of twenty-eight years complete, it must return to it again, and so far continue attached to it ever after. Either then there can be no truth in the preceding assumptions, or to carry back the simple Julian, or the simple Gregorian year, to the beginning, and to use it as the civil conventional type of the natural succession of annual time from the first, would infallibly in a very short space of time be found contradictory to the actual matter of fact; that is, to the course and succession of the nocti-diurnal cycle in terms of the annual, in the order of feriæ.

It appeared to me, therefore, (and this is the most important assumption, next to the two first of all, on which I have proceeded,) that the only course left was to adopt a civil or positive standard of the natural year, which should be always Julian, or as it might easily be rendered, always Gregorian, in principle; yet never actually Julian, or actually Gregorian, before the proper time: always in short *a* Julian, or always *a* Gregorian year, but never *the* Julian or *the* Gregorian, till the very point of time when the Julian or the Gregorian year, as it now is, became *de facto*, or *virtually*, the actual civil standard of the natural year itself, and of the constant succession of day and night in the order of feriæ also: for both these things, it should be remembered, have all along continued the same. Neither of them has ever varied from itself; and *mutatis mutandis* each is absolutely the same thing now, which it was at first, or at any intermediate point of time. This object has been accomplished, by means of a series of Julian types of one and the same standard of the natural year, each of them serving as its representative and its substitute for a limited period of time; which, with two exceptions only, is never less than 112, nor more than 140 years: and each of them, while it lasts, as close and exact an expression of the natural year in terms of the civil, and of the constant succession of night and day in the order of feriæ in both, as in the nature of things was possible, or at least necessary or desirable.

And as to the point of time above alluded to: I have already observed, that the true epoch of the Julian year, in use at present, (of that year, which we understand by the Julian as ruled and administered at present, of that year, which every chronologer would mean when he spoke of the Julian year, as carried back, for any length of time, from the present day,) the epoch of this year I say, is not the date of the correction of Cæsar, B.C. 46 or B.C. 45, but 269 or 270 years later, A.D. 225. This fact in particular has been demonstrated with as much certainty as any one thing besides, which I have undertaken to prove. Now the 35th type of my Julian year enters the Tables on the first of January at midnight, A.D. 225, along with the 270th Julian year, at Rome, on the kalends of January at midnight, and along with the corresponding Julian year of chronology, carried back from the present day, on the first of January at midnight, also. The cycle of the leap year, in each of these forms of the same kind of year, is the same: the Dominical letter is the same: in short, just at this point of time, there is no difference between these three things whatsoever: and if there is none at this moment of time, there can be none ever after.

There is another remarkable circumstance to distinguish this year. The actual epoch of the Gregorian correction was A.D. 1582 or 1583, when the 11th of March, the date of the Vernal Equinox for the time being, was called, and became, the 21st. Its virtual epoch, according to its own principles, was that point of time when the Julian date of the mean Vernal Equinox was first beginning to be March 21st. This too was the case for the first time, according to the system represented in my Tables, at the ingress of the 35th Julian type, A.D. 225; March 21st at midnight. The consequence was, that from this time forward, the administration of my Tables began to be Gregorian in principle; and never afterwards differed from the proper Gregorian, except *per accidens*. The Gregorian correction and my Tables agreed absolutely, A.D. 1583. They agree together at present; and must do so until the end of the nineteenth century, at least. It is another singular coincidence, that the Gregorian epoch of these Tables being April 25th at midnight, it stands at the distance of an even number of hebdomadal cycles from the proper Gregorian epoch, March 21st at midnight: and it could not possibly have made any real difference, it could have made only a nominal one, if April 25th, B.C. 4004, had assumed the name of March 21st, or March 21st, A.D. 1583 or A.D. 225, had assumed the style of April 25th.

After the System, of which I have thus endeavoured to give a brief and succinct account, had been digested and completed; and my attention had begun to be directed to the study of calendars, ancient and modern; I found, that without being aware of it, I had fallen on the same principle in general, as that which the Persian astronomers, A.D. 1079, recommended to the Sultan Melec-Schah Gjelâlo'dîn, for the correction and regulation of the Persian calendar; and which has ever since constituted the distinctive characteristic of the Gelalean calendar: a principle, which many chronologers and astronomers of modern times have much admired and applauded, and which the French Directory embodied in the year of their Republic; but which no one can approve of in the abstract, yet consistently withhold his approbation from the System of my Tables. The Gelalean correction assumes that the only authentic and never-varying standard of annual time is the natural year; which it reckons from the Vernal Ingress to the Vernal Ingress perpetually: though we must not give the Persian astronomers of Melec-Schah's time, credit for an original discovery, in fixing upon this point. It was the ancient rule of their calendar; as they very well knew from tradition. The Gelalean correction too, assumes a variable type of this invariable standard of annual time; and that type is Julian, as long as it lasts, to all intents and purposes; though it cannot agree with the Julian, except *per accidens*, and for a limited time. But the Gelalean calendar adopts a new Julian type of the natural standard, as often as the anticipation amounts to six hours of mean time; that is, once in 28 or 32, or even in 36 years: in my System, a fresh type is introduced only as often as the anticipation amounts to a day and a night complete, or may be cyclically assumed to have done so. And this is the great practical objection to the Gelalean correction; that it makes use of four or five different types of the same thing, when one was abundantly sufficient for all useful purposes. For there is really no practical end to be answered, nor any thing to be realized but a mere ideal perfection, by confining the relations of the natural and the civil year, within such narrow limits, as six hours of excess or of defect respectively. It is inconsistent with such a principle, to admit any leap day in the calendar at all; which the Gelalean calendar certainly does. It is impossible, in any case, to make such a calendar work harmoniously with the Julian, except for a few years together at a time: and it is clear, from that fact alone, that such a principle as the Gelalean, strictly applied to my System, never would have answered the purpose. It is a remarkable thing, explain it as we may, and it has long since been forced on my conviction by a variety of proofs, that the Julian correction, in the Providential controul and disposal of the course of time, must have been contemplated from the first; so that there is not one essential character, condition, or property of that correction at present, which must not be strictly attended to, and strictly preserved, in principle at least, from the first. And this is particularly true of the cycle of leap year, and of the cycle of 28 years, commonly called the Solar Cycle: which is so essential to the course of nocti-diurnal time in terms of annual from the first, that if B.C. 4004 was not the true year of creation, as I believe it to have been, some year 28 years earlier, or 28 years later, or some multiple of 28 before or after, must have been so: of which there is proof to be produced, of a very critical nature indeed. All these conditions are observed in my System of Julian time; which proceeds by cycles of 28 years, without interruption, from first to last.

And this is the true reason of the distinction of the lengths of my Julian periods themselves, sometimes into 112, sometimes into 140 years; that so I might have a standing expression of the mean Julian period, which was perpetually divisible both by the cycle of the leap year, and by the cycle of 28 years. The standard of the mean natural year, assumed in this system, is 365 days, 5h. 48m. 50sec. 24thds.; and though I must acknowledge I have not met with this in terms, in any author, ancient or modern, yet I have met with others, which differ but slightly from this; as Delambre's, 365 days, 5h. 48m. 51sec. 6thds.; and one of Lalande's, 365 days, 5h. 48m. 50sec., adopted by an eminent Mexican astronomer also, a contemporary and friend of his, Antonio Leon-y-Gama; who has left the best and most authentic account of the ancient Aztec or Mexican calendar. I have formed it too, on a careful comparison of fifty or sixty similar expressions of the same thing, ancient or modern, which have at different times fallen in my way.

Now the anticipation of this standard on the mean Julian is 11h. 9m. 36sec. annually; and that accumulates to 24 hours of mean time, within 21 sec. 36thds only, in 129 years: and this residuary difference or defect, in like manner, amounts to a day and a night complete, only in 516,000 years: so that for all practical purposes, it might be absolutely left out of sight for almost any length of time; certainly for no more than 6000 years; which is the utmost extent of time embraced by my Tables.

In 516 years this annual anticipation amounts to four days and nights complete: but though 516 would be divisible by 4, it would not be so by 28. I have gone on the assumption then, that the anticipation accumulates in reality to one day in 112 or in 140 years; and to four days sometimes in 504, sometimes in 532 years: and by these means, the real amount of the anticipation, in days and nights, and the cyclical one, from first to last, are so evenly balanced, that the last period of 516 years enters the Tables, on one side, A.D. 1545, and the last on the other, A.D. 1541; the former on March 10, at 23h. 53m. 9sec. 36thds. from midnight, the latter on March 11, at midnight.

The rule then of my Tables is this: To assume a fresh Julian type of the same natural course and succession of things, that is in the solar or tropical year, once in 112 or once in 140 years; after an order of alternation which is not arbitrary, but determined by the nature of things. And this brings us again to the point, from which we have been all this time digressing; the first and direct and proper effect of each of the miracles, both that of B.C. 1520, and that of B.C. 710, upon the different measures of time.

The first and direct and proper effect of each of those miracles was on the anticipation, or stated annual difference of the mean natural standard of the year, and the mean civil or Julian; by precipitating that anticipation 12 hours of mean time at once, over and above its stated and regular amount; and thereby antedating the operation of time on the proportions of the natural to the civil or Julian year, so much before its stated and regular period also. The date of the first miracle was the 49th year of the 20th Julian type; that of the second, the 19th of the 27th; and both these types are seen to be exhausted in 56 years' time, instead of 112.

As to any further effect, and on either of the other two measures, the cycle of day and night, and the cycle of the week, at the time; a moment's reflection will satisfy us, that the effect produced upon either of them, must have been *indirectly*, in the first instance at least; and *through* this on the anticipation; until the effect of both miracles, in their proper order of time, upon every cycle alike, and on every measure alike, was now complete: the proper period of which completion was not the date of the second miracle, but the last year of the period in which this miracle happened, B.C. 673. The actual cycle of day and night was not disturbed on either of these occasions: and the proportion of the mean to the actual cycle was not completely, but partially only disturbed, on each of the same occasions. The effect on the actual cycle at the time, was the necessity of an earlier readjustment of one and the same actual course of nocti-diurnal time, in the natural and in the civil year, to its proper relations in the order of the hebdomadal cycle or order of feriæ, on two several occasions, than otherwise would have been requisite. The effect on the mean cycle at last, was the entire and total absorption of two cycles of mean night and day, in one actual cycle of the same; the fact of which begins to appear, in the constant decursus of that cycle from the first, just at the end of Period 27, and just at the beginning of Period 28; when the epoch of this cycle, in order to fall in with the actual cycle at the same point of time, is seen to descend in the order of feriæ, over two days or two numbers at once; which two numbers, in the decursus of the nocti-diurnal cycle in the natural year, are the *feria tertia* and the *feria secunda;* and in that of the same, in the civil or Julian, are the *feria quarta*, and the *feria tertia;* the motion of this epoch in both, in the order of feriæ supposed to be always the same and fixed, being necessarily backwards, or retrograde; following the head of the natural year, which in the same order of feriæ, as supposed to be thus fixed and invariable, is necessarily retrograde or backwards also: though as to the course of the nocti-diurnal cycle itself, from its proper epoch perpetually, both in the natural and in the civil year, when properly adjusted one to the other, it is always forwards in the order of feriæ, not backwards.

## SECTION IV.

*On the importance of* B.C. 672, *as a Chronological and as an Astronomical epoch. Instance of the latter, in the date of the Heliacal rising of Sirius, at the epoch of the Sothiacal Period.*

It follows from these premises, that B.C. 672 is a most important epoch in chronology; and especially in tracing the succession of mean day and night, in terms of actual, and in the order of feriæ, by an uniform rule from the first. It is that point of time, at which the value of a given Julian date, the numerical exponent of a particular term in the former succession, referred to the latter, undergoes a change; which at this point of time must be strictly taken into account, if we would still carry on the succession of the two things, one in relation to the other, by the same rule as before.

The reason of this is, that we are compelled from the nature of things, to make use of one and the same set of Julian terms, to express both series of the nocti-diurnal cycle, both the mean and the actual; and so long as these are absolutely one and the same, no error nor inconvenience results from this necessity. But the moment the numerical succession of the mean cycle begins to differ from the numerical succession of the actual; one and the same set of third terms will no longer serve for both. There must be a change in the numerical value of some one of these third terms, in the order of both series, just at the moment in question; and it is easy to see that this change in the value of this third term, must take place in the order of the mean, not in the order of the actual. The extent of the change in the value of this third term, in this one of these cycles too, must go to the extent of the variation which has also taken place in the succession of this cycle, relatively to that of the other: and if this has been such, that just at this point of time two numerical cycles of the one have become no more than equal to one numerical cycle of the other, the same Julian term or exponent, before common to both, must either at this point of time, be eliminated from one of these series altogether, or change its nominal Julian value in the one, for its actual Julian value in the other. It is easy to see too, that this particular term in the Julian notation of the nocti-diurnal cycle from the first, will be March 28 in the natural year, and March 29 in the Julian; and that the particular point of time, at which this Julian term of March 28 in the former, or March 29 in the latter, in the constant expression of the nocti-diurnal cycle from first to last, undergoes this change, is B.C. 672. And yet it is easy to see also, that since at this particular moment, two numerical cycles of mean day and night are by hypothesis merged or absorbed in one numerical cycle of actual day and night; it is really no contradiction, it is only a difference in the *modus loquendi,* to say, that March 27 under such circumstances, in the equable succession of night and day in the natural year, takes up March 29 and March 28 both; and March 28, in the same succession in the civil year, takes up March 30 and March 29: that the constant and equable succession of the nocti-diurnal cycle from B.C. 672 downwards, after March 29, is carried on in the natural year not in March 28, but in March 27, and in the civil year, after March 30, not in March 29, but in March 28: and that beginning in the one case, March 27 at midnight, and in the other, March 28 at midnight, the same set of Julian terms or Julian exponents, will represent both the mean and the actual course of this cycle, and both in the natural and in the civil year, without any variation from that time forward, alike.

It is a necessary consequence of these conclusions too, that the head of the natural year, or, in other words, the point of the Vernal Ingress, having once been set at par with the head of the Julian or civil, on April 25 at midnight, B.C. 4004; with every period of 112 or 140 years, and, in two instances, of 56 years each, asunder, it will drop or descend one number only, and in the nature of things can drop or descend one number only, at a time, through twenty-seven such steps or descents, from B.C. 4004 to B.C. 672; but B.C. 672, with the twenty-eighth, it will drop or descend *per saltum*, through two numbers at once, from March 30 to March 28 at midnight: so that it will be literally true, that though the Julian date of the mean natural Vernal Ingress, from B.C. 4004 to B.C. 672, might fall, and must have fallen, on every day in its turn, between April 25 and March 29, besides; it never did and never could fall on March 29 itself: up to the end of B.C. 673, it was still falling on March 30, and with the ingress of B.C. 672, it began to fall on March 28. And there is no means of tracing the succession of Julian equinoxes, in the mean natural year, from the first down to the present day, by one and the same uniform rule of descent, except by assuming the first date of that kind, April 25 at midnight as equal to April 24 at midnight; and every date of the same kind afterwards, from B.C. 4004 to B.C. 672, one number, in like manner, lower than the truth.

It is another consequence of these conclusions, that in reducing the sum of any number of actual nights and days, from a point of time before B.C. 672 to a point of time after, to the corresponding number of mean; the sum total of the latter must always be assumed as one more than that of the former. It is impossible that this can be otherwise: if it is actually matter of fact that B.C. 672, and at a moment of time which admits of being precisely defined, two numerical cycles of mean night and day were merged in one of actual. Nor does it make any difference to this necessity, from what point of time before B.C. 672 to what point of time after, you may be supposed to reckon. The same allowance must still be made for a difference of one entire cycle of mean day and night, between the sum total of actual cycles of night and day, and the sum total of mean, in the complex of time in question, be it greater or be it less; or there will unavoidably be an error of twenty-four hours of mean time, at last, which will be detected, if by nothing else, yet by the course and succession of every numerical cycle of either kind, in the hebdomadal cycle, or order of feriæ perpetually.

I cannot help thinking too, it is of just as much importance to astronomers, as to chronologers, to be made aware of this fact; and that the Julian dates of celestial or astronomical phenomena, before and after B.C. 672, respectively, no more than those of chronological facts, are not to be cast in one and the same mould, or to rise or descend perpetually according to one and the same rule. The Julian dates of the mean natural Vernal Ingress, are one class of physical or astronomical facts; of which I have already shewn, that in tracing them constantly downwards, from B.C. 4004 to the present day, it is necessary to make an allowance for a descent, *per saltum*, in the regular series of Julian exponents of that kind, B.C. 672, from March 30 to March 28, at once: and by parity of reason, in tracing them upwards again from the present day to B.C. 4004, for a similar rise *per saltum*, just at the same point of time, from March 28 to March 30 again; yet without any interruption in the order or continuity of the series itself, on either occasion or in either way: for, after what has been said, it must be evident that the descent, in one of these cases, and the spring in the other, is only nominal after all, and not real; and that in one of these cases, March 29 is merged in March 28, and in the other in March 30; or what comes to the same thing, that March 29, in coming down from the first, after B.C. 673 is tantamount to March 28, and in going back again, after B.C. 673 is tantamount to March 30. I apprehend that the same mode of reasoning must be just as applicable to the case of every other astronomical fact or phenomenon, older than B.C. 672, which the astronomer might undertake to calculate backwards from the present day; and having first of all determined by the proper rules of his science, should then find it necessary or convenient to define and enunciate chronologically, in terms of the Julian calendar.

The Julian dates of the Cosmical or the Heliacal risings of any of the fixed stars, at a point of time earlier than B.C. 672, would be of this description: and there is one such date, that of the Heliacal rising of Sirius for the meridian of the ancient Heliopolis in Egypt, which is very important, as the means of determining the true chronological epoch of the Sothiacal period of the Egyptians; and through that of the first modification of the primitive calendar, any where introduced among mankind; if we except the particular community of the people of Israel. The calendar which the Israelites received at the time of the Exodus, by Divine appointment, is older than the Sothiacal period; and yet was derived from the primitive calendar of all antiquity as much as any other of later date. Out of Judæa, however, the Sothiacal calendar of the Egyptians was in reality the oldest modification of the primitive calendar, common to all mankind, the traces of which I have been able to meet with. The Chinese, indeed, pretend to an older modification of this kind, and so do the Hindoos: but I have good grounds for asserting that both these pretensions are vain and chimerical, especially that of the Chinese, which is the more extravagant of the two. I am much mistaken if the Chinese calendar is really older than B.C. 657: and I am equally well assured that the Hindoo is not older than B.C. 1306; and though that date may come very near to the epoch of the Sothiacal period, it still falls short of it: and that it should both approximate to the latter, yet still not actually come up to it, will appear to be nothing surprising, when the relation of the Hindoo to the Egyptian calendar is once understood; and it comes to be known, that the first idea of the Indian correction of the primitive calendar itself, was actually borrowed from the Egyptian.

Now, it happens to be known from the testimony of Censorinus, that a Sothiacal period came to an end in A.D. 139. He gives us to understand, at least, that the first of the equable Thoth, and the xii. kal. Aug., or, as learned men commonly correct his text, xiii. kal. Aug., July 20, the stated date of the Heliacal rising of Sirius in Egypt, in A.D.

139 were coinciding together: and this concurrence, as a matter of fact, would seem to be competent to define the close of one Sothiacal period, and the beginning of another; the period itself being neither more nor less, as the name implies, than the interval in years, between one instance or observation of the rising of Sirius in the morning twilight on the first of the equable Thoth in Egypt, and the next sensible instance or observation of the same kind; between any two cases of which kind, under the same or similar circumstances, it is generally assumed that there could not be less than 1460 Julian years at least.

Chronologers, therefore, have commonly supposed that if a Sothiacal period was just come to an end, with the Heliacal rising of Sirius on the first of Thoth, A.D. 139, it must have begun with the Heliacal rising of Sirius on the first of Thoth, B.C. 1322; and that if the first of Thoth coincided with July 20, A.D. 139, it coincided with July 20, B.C. 1322. Neither of these suppositions is strictly correct. I will observe however, at present only, that the ancient Sothiacal period was a Julian period of a certain kind; and the ancient Sothiacal calendar was strictly a Julian calendar: only that the cycle of leap year in this calendar, was not the same with that of the Julian, but with that of the Alexandrine, which is, in fact, that of the modern Coptic calendar: and the relation of this to the Julian is such, that it anticipates six months on the Julian, supposed to bear date from March 1 in leap year, perpetually. The proper Julian epoch of the Sothiacal calendar, then, was two-fold, after a time at least; July 21 and July 20: July 21, in the first year of the cycle of leap year; July 20, in the three last.

Now, it has often been put to the test of calculation, on what day, in the proleptical Julian year, Sirius or Sothis would rise heliacally for the meridian of Heliopolis, at the epoch of the Sothiacal period. Bainbridge calculated this date for A.D. 139, and B.C. 1322; Petavius, for A.D. 1599; Mr. Ideler, for B.C. 1782; all which numbers stand at the distance of one supposed Sothiacal period from each other, respectively: and by a very singular coincidence, which is unexampled in the case of any other star, and which seems still to require clearing up, they all determined it to one and the same day, July 20, alike. This proves, undoubtedly, that there is, or has been, a stated connection between this particular phenomenon, for the meridian in question, and this particular Julian date: and yet that very statedness, at first sight, only adds to the mystery; if it necessarily follows from it, that the anticipation of the natural on the Julian year, which in every other instance of the same kind amounts to a day in 71½ years, or to two days in 143 years, in the case of this particular date, seems to be absolutely nothing at all, even for ever so long a time. It is usual with chronologers, both ancient and modern, to estimate the amount of the change in the place of the fixed stars, which is perpetually going on, at one degree in space, and at one day in time, in 72 years, or thereabouts; on which principle, the Julian date of the rising of a particular star, at the end of a Sothiacal period of no more than 1460 years, ought to be twenty days later at least, than the same date at the beginning; especially after A.D. 225: for, I am free to admit, that before A.D. 225, it could not, or ought not, to be more than eight or nine, at most. Yet here is a star, viz. Sirius or Sothis, which, for 3000 years and upwards, as far as calculation is able to discover, has never varied a day in time, whatever it may have done in space: and this seems to me something so peculiar and so extraordinary, that I should be much obliged to any scientific and practical astronomer who would consider it and explain it. Petavius has remarked on this peculiarity, and so has Mr. Ideler; and the latter resolves it, if I remember right, into "a combination of happy circumstances," and "the accidental position of Sirius itself on the circles of latitude and of longitude, respectively." I apprehend, however, if the fact is as calculation appears to have discovered, it must admit of a satisfactory explanation: and perhaps it may involve considerations of some importance to the history of ancient sidereal astronomy. It seems at least nearly to affect the question of the sagacity of the ancient Egyptians; and whether they were aware of this property of Sirius beforehand, when they fixed on the Heliacal rising of that star, to be the fixed and invariable epoch of a calendar or a period, intended to be equally fixed and invariable also.

But with regard to the date of this phenomenon, for a point of time which goes so much further back than B.C. 672; I submit it to the consideration of more competent judges than myself, whether, after what has been said, if calculation determines it to July 20, at a certain time in the morning, it ought not to be assumed as truly July 21, at the same time. To put this question to the test, indeed, we ought to be in possession of some well authenticated testimony to the actual date of the rising, at the beginning of any one period; either in some other calendar date which could be reduced to the Julian, or more particularly in the order of feriæ, or order of the days of the week, which of all others, would be the most sure and infallible criterion of truth in such a case as this. But though this cannot be had at present, in the case of the Sothiacal period; there is still something analogous to it, and almost as well calculated to answer the same purpose; viz., the fact, traditionally handed down from the first, and as far as I know, admitted by all chronologers; That the Sothiacal period took its rise on the first of Thoth, when the first of Thoth was coinciding with the Heliacal rising of Sirius. Now the true date of this celebrated period is not B.C. 1322, but B.C. 1350: and the first of Thoth, B.C. 1350, was not falling on July 20, but on July 22; and B.C. 1349, in the second year of the period, on July 21. The proper epoch of the period then, from the first, was July 22 and July 21, not July 21 and July 20; for, from the necessity of the case, it must have a double epoch, July 22 and July 21, or July 21 and July 20; the former, in the first year of the cycle of leap year in this period; the latter in the three last, perpetually. These, I say, must have been the standing Julian dates of this period, from the first, down to B.C. 672: but after B.C. 672, July 21 and July 20. If calculation, then, is not in the wrong, in determining this standing date, before B.C. 672, to July 20; it must be, because July 20, before B.C. 672, is absolutely equivalent to July 21. But in that case, it ought rather to be called July 21, than July 20.

## SECTION V.

*On the effect of the two miracles on the lunar measure of time; and on the right construction of the words of Joshua, as addressed to the moon.*

I shall now proceed to that which I always intended to be the proper subject of this communication; the effect of the same two Scriptural miracles on the lunar phenomena, and on the lunar momenta; of which nothing has yet been said: though possibly what has been premised, may have its use in preparing the way for the reception of the truth on this point too.

The conclusion, to which I have seen reason to come on this question also, is, That the motion of the moon about the earth was directly affected by each of the miracles, which affected the motion of the earth about itself; so much so, that when an addition of twelve hours of mean time was made on each of those occasions to the current cycle of night and day, an addition of twelve hours of mean time was made on each of the same occasions, to the current lunation, or cycle of the natural month.

I think we should be justified in inferring this fact of the first of these two occasions, even from the words attributed to Joshua; commanding the moon to stand still as well as the sun; and from the testimony subjoined to the effect of those words; that the moon *did stand* still, as well as the sun: particularly when we considered, that though the sun has no proper motion of its own, of any kind, which could possibly be taken into account in a case like this, the moon has such a motion, which is perpetually carrying it forward from west to east; and that we could not suppose the proper motion of the earth about itself, and with it the apparent motion of the heavens from east to west, to have been suspended for twelve hours of mean time, yet the proper motion of the moon in particular, from west to east, to have been continuing all that time as before, without being obliged to suppose a change in the place of the moon, at the end of that time, compared with its place at the beginning, equal to 6° 36m. 53sec. at least: and that, I think, must have been too great not to be sensible even to a superficial observer, at the time; or to be consistent with the plain declaration of Scripture, that the moon had been *dumb* or *still*, stationary and motionless, all the while; a declaration, not only historically subjoined at the time, but repeated by the Prophet Habakkuk, in his reference to the same event so long after.

For I have always been under the persuasion, that even in such cases as these, the language of Scripture cannot be construed too closely or too circumstantially; if by so doing, it is only brought so much the nearer to the truth of physics, and to the language which science itself would employ in the same case, with a view to the same effect: and, therefore, if Scripture says, that the moon, in this instance, was commanded to stand still, and that the moon did stand still, we are bound to believe it was actually intended to stand still, and actually did stand still; unless it could be shewn, that no such meaning could possibly have been implied in those words, on the one hand, or that no such effect could possibly have resulted from them, on the other. It might be contended, indeed, that the moon was *commanded*, and the moon was *intended*, to stand still, just in the same sense that the sun was: but it ought to be remembered that the sun could be intended to stand still, and therefore could be commanded to stand still, only in *one* sense; whereas the moon might be commanded to stand still, and therefore might be intended to stand still, in more senses than one; and we have no right to contract the scope and comprehension of the words addressed to the moon, merely because we cannot enlarge to the same extent, the force and meaning of those addressed to the sun.

And with regard even to the command addressed to the sun: Are we to suppose it was not intended or expected by Joshua, to be followed by some proper effect? That it was not expected something would stand still, in consequence of that command, which was not standing still before? And what are we to suppose this was expected to be? The apparent motion of the sun in the heavens, or the real motion of something else, which is the cause of that? I am well aware that smatterers in science, minute philosophers, and disingenuous sceptics, have never missed an opportunity which came in their way, of sneering at the language attributed to Joshua on this occasion, as a very triumphant proof of the childish ignorance and misapprehension of physical truth, which appears, as they suppose, in Scripture: as if the sun was commanded to stand still, or the sun was expected to stand still; or as if the sun could have stood still: though such persons never had the sense to reflect, or the fairness to allow, that the sun is perfectly capable of standing still in the same manner in which he is capable of moving; and might be said at any time to have stood still, in the same sense in which it must otherwise have been said that he had moved. But such objections as these never appeared to me to be worthy of a serious answer. No true philosopher, no real man of science, nor even any candid free-thinker, if such a person is to be found, would think of excepting to the truth of the Scriptural narrative of the miracle, on any such frivolous grounds as these; which, after all, are merely cavils about words and forms of speech; and leave the only real question, that of the *fact*, or what was actually done on this occasion, and what was not, just where it was. Or else, I have seen every reason to conclude, that long before the time of the Exodus, astronomy had been carried to such a degree of perfection in Egypt, that to suppose either Moses, "learned in all the wisdom of the Egyptians," or Joshua his contemporary, even humanly speaking ignorant of one of the simplest and most elementary truths of the science, the true physical cause of the cycle of night and day, and of the motion of the sun in the heavens, would be just as rational, and just as probable, as to suppose the same of any one person of common education, and common information on such subjects, at the present day. And yet for all that, in commanding the sun to stand still, and not the earth in its motion about itself, Joshua only spoke the language of common sense: and in repeating the words of Joshua, Scripture only adopts the language of common sense: between which and the language of true philosophy there never can be any contradiction. No one, therefore, has a right to assume that when commanding the sun to stand still, Joshua did not intend to stop the real motion of the earth about itself; or that he was not previously aware that the true physical cause of that seeming motion of the sun in the heavens was the actual motion of the earth about itself. And if he intended to stop a real motion when he addressed the sun, which had no such motion of its own; *a fortiori* must he have intended and expected the same thing, when he addressed the moon, which had a real motion of its own.

## SECTION VI.

### *On the probability or improbability* a priori, *that the moon's motion about the earth would be suspended, if the earth's motion about itself was suspended, or changed in any way, also.*

The state of this question is this: Supposing such an effect, as the cessation of the motion of the earth about itself for a certain length of time; would it be more probable or more improbable *a priori*, that the motion of the moon about the earth, for the same length of time at least, would be suspended also? And in answer to this question I say, It is more probable it would, than that it would not: it follows, even from the relation of the earth to the moon, and of the motion of the one to that of the other, that it would be suspended, more probably than that it would not.

For first, the relation of the earth to the moon is peculiar. It is not that of one of the heavenly bodies to the rest in general; not even to those, which are parts of the same system. It is that of primary and secondary; of planet and satellite; in one word of superior and inferior; of principal and subordinate. And in this common relation, the earth is the superior, the moon the inferior, party. It does not appear, as far as I know to the contrary, that all the discoveries in astronomy hitherto made, have brought a single fact to light, from which we should be justified in concluding that the moon was ever designed for any other purpose, or has ever fulfilled any other purpose, than that of a satellite, in constant attendance on the earth. This being the case; if the motion of the primary planet were to be purposely and deliberately stopped, by the act of the same Creator, who first appointed one of these two to attend on the other, and first adjusted the motions of each to those of the other accordingly; though it becomes us to speak on such questions with all possible diffidence, and all possible reverence and circumspection; yet even to our own apprehensions of what was befitting, and what was consistent from first to last, it must appear to be greatly more probable that the motion of the secondary planet, under such circumstances, would be suspended, than that it would not.

Secondly, I would respectfully inquire of any judicious and skilful astronomer of the present day, whether the original relations of the heavenly bodies one to another, (and especially those of such as are and have been most closely connected from the first, the principal planets and their satellites,) whether the proportions of these to each other, the subserviency of one of them to the other, the dependence of one on the other, the harmony of both together, are so well understood, that he could undertake to say, if any of the movements impressed on the earth in particular at first, in common with certain corresponding movements of the moon, and kept up and preserved inviolate for so many thousand revolutions of the same kind of motions in conjunction, and in the same kind of relation one to another, were to be interrupted; the corresponding movement of the moon might not require to be interrupted also? Whether it might not only be fitting and proper, but even necessary to interrupt it?

I should wish to inquire, at least, if there is not a very perceptible and definite proportion subsisting at all times, between the motion of the moon about the earth, and the motion of the earth about itself? particularly when it is considered, that these motions are constantly going on, and both in the *same direction;* yet that the law, which has been established between them, *de facto*, both is, and always has been, that one entire revolution of the moon about the earth must be performed in neither more nor less than twenty-nine or thirty entire revolutions of the earth about itself. If there was anything necessary, anything fixed and invariable in this law, and in this proportion, from the first; then, if something happened, to affect the motion of the earth about itself, for a limited time and for a particular purpose; what alternative would there be, it might be asked, except to suspend the motion of the moon about the earth also, till this temporary interruption was past? It is the law of these motions in conjunction at present, as far as I understand it, that while the earth is describing one entire revolution about itself, the moon shall describe $\frac{1}{30}$ or $\frac{1}{29}$ of the surface of the earth, that is, from 12° to 13°; but not that the moon shall describe 20° of the surface of the earth, while the earth is describing one revolution about itself. If then, for a particular end and purpose, the motion of the earth about itself were to be suspended for twelve hours; whether of the two would be the greater anomaly? that the moon's motion about the earth should be suspended for twelve hours also? or that the moon should describe 20° of the earth's surface, when she ought to have described only 12° or 13° at the utmost? Nor let it be answered to this question, That no one would be conscious of this anomaly: no one would be cognizant of the fact; even if it happened. That is more than we can undertake to say. It is too much to assume, that mankind are the only astronomers in *rerum natura;* or that there is not an infinite number of intelligent beings besides ourselves, to perceive, to comprehend, and to keep account of the heavenly motions, at all times; and that their sense of fitness and propriety might not be much more likely to be consulted in the economy of these miracles, epecially in the more latent and insensible part of them, than our own.

And here, we are bound to take into account the actual relation of the lunar to the nocti-diurnal motion, when each of these miracles took place. At the date of the first, May 31, B.C. 1520, the moon appears to have been, as nearly as possible, for the meridian of the ancient Gibeon, just twenty-four hours past the full; which must have taken place at six A.M. of mean time, May 30. Now, it is the law of the lunar revolution, that at the time of opposition, the moon's elongation shall not exceed 6 signs; and twenty-four hours after the opposition, shall not exceed 6 signs, 13°. It is the general law of the same thing too, that at opposition or full, the moon shall rise as the sun is setting, and set as the sun is rising: and I have been informed, that for the climate of Judæa, there cannot be more than half an hour's difference between these things, at the full. If so, twenty-four hours after the full, there could not be more than an hour and an half's difference, between the time of the moon's setting and that of the sun's rising; and there might be no more than half as much.

If then the moon was setting on the morning of May 30, about six A.M. with an elongation of 6 signs; she would be ready to set, at six A.M. on the morning of May 31, with an elongation of 6 signs, 13°; not more. Suppose then, the motion of the earth stopped, soon after sunrise, May 31, for twelve hours' time; but the motion of the moon to go on as before. She would be actually setting at last, for the first time after the opposition, with an elongation of $6^s$ 20°: and this would be so much at variance with the whole harmony and proportions of the nocti-diurnal and the lunar motions in conjunction from the first; that if we may be permitted to give an opinion about it, we should think it much more probable, that the moon's motion would be absolutely stayed for twelve hours' time, to prevent such an anomaly, than that any such anomaly would be allowed to take place. By these means, twelve hours of mean time might be added *bona fide* to the length of that lunation; yet nothing whatever to the moon's elongation from the sun, at any place of her orbit, or at any period of her revolution therein.

The date of the second miracle was May 31, B.C. 710; and the sun and the moon at that time were as nearly as possible in conjunction. There is a solar eclipse in Pingre, for the meridian of Paris, B.C. 710, March 4, at three A.M.; from which we obtain a mean new moon, for the meridian of Jerusalem, May 31, 7h. 23m. P.M.; the second in that month, and that year: and were this conjunction to be accurately calculated, it is most probable it would not be found later than that time, but earlier. Now I reckon, that the actual time of the second miracle, May 31, B.C. 710, that is, the time when the ἀποκατάστασις of the sun, from the horizon in the west to the horizon in the east again, began sensibly and visibly to take place, was as nearly as possible 4h. 38m. of mean time, P.M.; the intermediate point of the tenth and the eleventh hour of kæric time, on the day and for the meridian in question. And very possibly this was the true time of the second conjunction that year, in May, also.

Here then the state of the case was reversed. The moon's elongation from the sun, at this particular moment, was $0^s$: and in the natural course of things, that moon would have been setting, about 6. 58. P.M. the same day, with an elongation still = 0. Are we then to suppose, it actually set at last, for the first time *de facto* after the conjunction, contrary to all the analogy and all the harmony of every conjunction before or after, with an elongation $= 0^s\ 6^\circ\ 13^m$ at least? Besides, as this moon was either with, or approaching to, the sun, when the sun began to move back in the heavens; it must have been carried back from west to east along with the sun also: and if its proper motion was not suspended meanwhile, until it was again brought along with the sun to the same place as before in the west, that conjunction *de facto* would take place at sunrise and in the east, which by the law of the lunar and of the nocti-diurnal motion; in conjunction, till then, was bound to have taken place at sunset and in the west: and rather than this anomaly too should occur, the moon's proper motion might be purposely suspended.

## SECTION VII.

### *On the tests or criteria of the effect of the miracles on the lunar motions, available at the present day.*

The stated and regular epact of the mean lunar year, (that is the anticipation of twelve consecutive mean lunations of almost any standard which might be assumed, on the mean civil or Julian year,) is ten days, twenty-one hours, and a little more. If, then, we supposed an addition of twelve hours of mean time, on some one occasion, made to the latter, but not to the former; this stated and regular difference at the end of that particular lunar, and that particular Julian year, instead of ten days, twenty-one hours, would be found to be eleven days, nine hours; and the date of the first mean lunation in the next lunar year, instead of being ten days, twenty-one hours only, earlier than that of the first in the preceding, would be eleven days, nine hours earlier. If we supposed the same thing, on some other occasion, a second time; this effect would of course be repeated: and the state of the case at last would be the same, as if we supposed an addition of twenty-four hours of mean time some time or other made at once, to the stated length of the mean Julian year, but nothing whatever added to the stated length of the mean lunar: the consequence of which would infallibly be, that from the time when this effect was completed, the Julian date of every mean lunation would anticipate twenty-four hours of mean time on what it must otherwise have been, if no such anomaly had taken place. And though, in thus speaking, I seem to confine the effect to the *mean* lunar year, and the *mean* lunation; it is easy to see, that under such circumstances as we are supposing, it would and it must be equally true of the *actual* lunar year, and the *actual* lunar month; and that every actual lunar date, under such circumstances, from the time when this anomaly was once complete, in terms of the civil or Julian year, would be twenty-four hours of mean time earlier than it would otherwise have been.

It follows, that if the date of one of these additions was B.C. 1520, and that of the other B.C. 710; the actual date of every lunation from B.C. 1520 to B.C. 710, must be twelve hours of mean time earlier than it would otherwise have been: and the actual date of every one subsequent to B C. 710, must be twenty-four: and if so, that the actual date of every lunation which is occurring at present in the stated and regular course of things, and has done so ever since B.C. 710, must be just one night and one day of mean time earlier than it might, and it would, otherwise have been.

If, therefore, an astronomer, assuming as his base or point of departure the date of an actual lunar conjunction, or an actual lunar opposition at present, were to calculate from that the date of a lunar conjunction or a lunar opposition, which did not go so far back as B.C. 710; though under these circumstances we might possibly expect him to find a difference of some kind or other, between the calculated date and the actual date of the phenomenon in question; we should not expect him to find a difference amounting to twenty-four hours of mean time, nor to any such amount. But if he were calculating his lunar conjunction or his lunar opposition, under the same circumstances, for a date which went back beyond B.C. 710; then, if he did not take into account the anomaly of which we have hitherto been speaking, and which first took full and complete effect in B.C. 710 itself, we should expect him to find that there was a difference of twenty-four hours of mean time, at last, between the calculation and the truth; and that calculation, under such circumstances, would infallibly shew the date of the phenomenon twenty-four hours at least earlier than the truth.

It is a providential coincidence, therefore, that the first three of that list of lunar eclipses, which I began with furnishing *supra*, are all older than B.C. 710; and yet are the actual dates of such phenomena, as they were observed by eye witnesses, and as they were recorded at the time. Let the test of calculation be applied to each of these in its turn, from the present day backwards. This, indeed, has been often done. The same eclipses, as determined by Pingre, are instances of that. And though in none of these cases has calculation been found to agree exactly with observation; it has never been found to differ from it by twenty-four hours, nor by twelve, nor even by six: from which fact, I think, the inference is necessary, that no error could have been involved in such calculations, either at first, or in the course of the process; none at least which amounted to so much as twenty-four hours of mean time in extent.

It seems to me, that there is but one reasonable and satisfactory explanation to be given of this fact; viz., either that there never has been, *de facto*, any the least disturbance of the relations of nocti-diurnal, of annual, and of lunar time, one to another, from the first; or if there has been any such disturbance of some of these relations, it has affected the rest also: every measure of time, in relation to the rest, has been affected and has been disturbed by it alike. I believe that this last is the true explanation of the fact; and that consequently when twelve hours of mean time were added to the cycle of night and day, on two several occasions, and twelve hours of mean time, on two several occasions, were added to the mean length of the Julian year, twelve hours of mean time on the same two occasions were added to the cycle of the month: by which means, but which alone, the relations of noctidiurnal, of annual, and of lunar time one to another, before and after each of those additions, would continue absolutely the same; and just as much so, as if nothing of the kind had happened.

There is another way, however, of putting the question of the matter of fact on each of these occasions, still more decidedly to the test. I have been given to understand, that though the length of one mean lunation and the actual interval between two oppositions or two conjunctions in sequence, except under very peculiar circumstances, can never be the same; still the proportion of the one to the other cannot exceed certain limits in excess or in defect: and what holds good of one mean lunation and one actual lunation, I presume may be supposed to hold good of any number of mean lunations, and the same number of actual.

Now, if we know the actual dates of one or more lunar oppositions, before B.C. 710, from observation, and the actual dates of any number more, after B.C. 710, from observation also; we know the actual interval in actual Julian time, from one of these dates to another: and we can reduce that actual interval to nights and days of mean uniform length accordingly. We know, too, the number of actual lunations between one of these observations and another; or we can easily determine it: and knowing the number of actual, we know the number of mean, which must be the same with that of the actual. We know too the sum of nights and days, under such circumstances, contained in the actual: but as to the number contained in the mean, and whether the same, under such circumstances, with that in the actual; this is the point to which I wish to direct attention at present.

If the length of the actual lunar month in no one instance has ever been different from usual; a given number of mean lunations of any standard which might be assumed from the time of Sir Isaac Newton, and the same number of actual lunations, each reduced to nights and days of the same standard alike, ought to contain the same number of such nights and days, or their parts, within certain limits at least: which limits a practical astronomer would always be able to define; and which I have seen put in books, at not more than thirteen or fourteen hours, or at least not more than seventeen or eighteen at the utmost. We have then, three dates of lunar eclipses or lunar oppositions, all older than B.C. 710, and seven similar dates, all later than B.C. 710; and each assigned from observation: which it is easy to take and to compare *seriatim* together, after the manner thus suggested. And this I shall proceed briefly to do; submitting the results to the consideration of more competent persons, without any comment or observation of my own.

## SECTION VIII.

*Intervals, in actual lunar or Julian time and in mean lunar time, between the three eclipses recorded at Babylon before* B.C. 710, *and the seven recorded at Babylon after* B.C. 710.

| | | | H. | ′ |
|---|---|---|---|---|
| I. | B.C. 721. | March 19. | 21 | 30 |
| | B.C. 621. | April 22. | 5 | 50 |

| | D. | H. | ′ |
|---|---|---|---|
| Actual interval, 100 years, + | 33 | 8 | 20 |

Lunations, 1,238.

|  | D. | H. | ' |
|---|---|---|---|
| Remaining from the last leap year, |  | 0 | 0 |
| 100 mean Julian years = | 36,525 | 0 | 0 |
| Add | 33 | 8 | 20 |
|  | 36,558 | 8 | 20 |
| Add |  | 24 hours. |  |
| Mean days and nights | 36,559 | 8 | 20 |

|  | D. | H. | ' | " | ‴ |
|---|---|---|---|---|---|
| Lunar standard, (Newton) | 29 | 12 | 44 | 3 | 9 |

|  |  | D. | H. | ' | " | ‴ |
|---|---|---|---|---|---|---|
| 1000 mean lunations | = | 29,530 | 14 | 12 | 30 | 0 |
| 200 | = | 5,906 | 2 | 50 | 30 | 0 |
| 30 | = | 885 | 22 | 1 | 34 | 30 |
| 8 | = | 236 | 5 | 52 | 25 | 12 |
| 1238 |  | 36,558 | 20 | 56 | 59 | 42 |
| Add |  |  | 12 hours. |  |  |  |
| Mean nights and days |  | 36,559 | 8 | 56 | 59 | 42 |
| Julian interval |  | 36,559 | 8 | 20 |  |  |
| Difference |  | — |  | 36 | 59 | 42 |

|  |  |  | H. | ' |
|---|---|---|---|---|
| II. | B.C. 721. | March 19. | 21 | 30 |
|  | B.C. 523. | July 16. | 23 |  |

|  | D. | H. | ' |
|---|---|---|---|
| Actual interval, 198 years, + | 119 | 1 | 30 |

Lunations, 2,453.

| | | D. | H. | ′ |
|---|---|---|---|---|
| Remaining from the last leap year, | | | 0 | 0 |
| 100 mean Julian years | = | 36,525 | 0 | 0 |
| 90 | = | 32,872 | 12 | 0 |
| 8 | = | 2,922 | 0 | 0 |
| 198 Complete nights and days, | | 72,319 | 0 | 0 |
| Add | | 119 | 1 | 30 |
| | | 72,438 | 1 | 30 |
| Add | | | 24 hours. | |
| Mean nights and days | | 72,439 | 1 | 30 |

| | | D. | H. | ′ | ″ | ‴ |
|---|---|---|---|---|---|---|
| 2000 mean lunations | = | 59,061 | 4 | 25 | 0 | 0 |
| 400 | = | 11,812 | 5 | 41 | 0 | 0 |
| 50 | = | 1,476 | 12 | 42 | 37 | 30 |
| 3 | = | 88 | 14 | 12 | 9 | 27 |
| 2,453 | | 72,438 | 13 | 0 | 46 | 57 |
| Add | | | 12 hours. | | | |
| Mean nights and days, | | 72,439 | 1 | 0 | 46 | 57 |

| | D. | H. | ′ | ″ | ‴ |
|---|---|---|---|---|---|
| Julian interval, | 72,439 | 1 | 30 | 0 | 0 |
| Lunar, | 72,439 | 1 | 0 | 46 | 57 |
| Difference, | — | | 29 | 13 | 3 |

| | | | | H. | ′ |
|---|---|---|---|---|---|
| III. | B.C. 720. | March | 9. | 0 | 0 |
| | B.C. 502. | Nov. | 19. | 23 | 36 |

| | D. | H. | ′ |
|---|---|---|---|
| Actual interval, 218 years + | 255 | 23 | 36 |

Lunations, 2,705.

| | | D. | H. | ′ |
|---|---|---|---|---|
| Remaining from the last leap year, | | | 6 | 0 |
| 200 mean Julian years | = | 73,050 | 0 | 0 |
| 10 | = | 3,652 | 12 | 0 |
| 8 | = | 2,922 | 0 | 0 |
| 218 Complete nights and days, | | 79,624 | 0 | 0 |
| Add | | 255 | 23 | 36 |
| | | 79,879 | 23 | 36 |
| Add | | | 24 hours. | |
| Mean nights and days, | | 79,880 | 23 | 36 |

| | | D. | H. | ′ | ″ | ‴ |
|---|---|---|---|---|---|---|
| 2000 mean lunations | = | 59,061 | 4 | 25 | 0 | 0 |
| 700 | = | 20,671 | 9 | 56 | 45 | 0 |
| 5 | = | 147 | 15 | 40 | 15 | 45 |
| 2,705 | | 79,880 | 6 | 2 | 0 | 45 |
| Add | | | 12 hours. | | | |
| Mean nights and days, | | 79,880 | 18 | 2 | 0 | 45 |

| | D. | H. | ′ | ″ | ‴ |
|---|---|---|---|---|---|
| Julian interval, | 79,880 | 23 | 36 | 0 | 0 |
| Lunar, | 79,880 | 18 | 2 | 0 | 45 |
| Difference, | — | 5 | 33 | 59 | 15 |

| | | | H. | ′ |
|---|---|---|---|---|
| IV. | B.C. 720. | September 1. | 20 | 30 |
| | B.C. 502. | November 19. | 23 | 36 |

| | H. | ′ |
|---|---|---|
| Actual interval, 218 years, + 79 days, | 3 | 6 |

Lunations, 2,699.

| | | | D. | H. | ' |
|---|---|---|---|---|---|
| Remaining from the last leap year, | | | | 6 | 0 |
| 200 | mean Julian years, | = | 73,050 | 0 | 0 |
| 10 | | = | 3,652 | 12 | 0 |
| 8 | | = | 2,922 | 0 | 0 |
| 218 | Complete nights and days, | | 79,624 | 0 | 0 |
| | Add | | 79 | 3 | 6 |
| | | | 79,703 | 3 | 6 |
| | Add | | | 24 hours. | |
| | Mean nights and days, | | 79,704 | 3 | 6 |

| | | | D. | H. | ' | '' | ''' |
|---|---|---|---|---|---|---|---|
| 2000 | mean lunations | = | 59,061 | 4 | 25 | 0 | 0 |
| 600 | | = | 17,718 | 8 | 31 | 30 | 0 |
| 90 | | = | 2,657 | 18 | 4 | 43 | 30 |
| 9 | | = | 265 | 18 | 36 | 28 | 21 |
| 2,699 | | | 79,703 | 1 | 37 | 41 | 51 |
| | Add | | | 12 hours. | | | |
| | Mean days and nights, | | 79,703 | 13 | 37 | 41 | 51 |

| | D. | H. | ' | '' | ''' |
|---|---|---|---|---|---|
| Julian interval, | 79,704 | 3 | 6 | 0 | 0 |
| Lunar, | 79,703 | 13 | 37 | 41 | 51 |
| Difference, | — | 13 | 28 | 18 | 9 |

---

| | | | H. | ' |
|---|---|---|---|---|
| V. | B.C. 720. | March 9. | 0 | 0 |
| | B.C. 491. | April 25. | 23 | 30 |

Actual interval, 229 years, + 47 days, 23 H. 30 '

Lunations, 2,834.

| | | D. | H. | ' |
|---|---|---|---|---|
| Remaining from the last leap year, | | | 6 | 0 |
| 200 mean Julian years | = | 73,050 | 0 | 0 |
| 20 | = | 7,305 | 0 | 0 |
| 9 | = | 3,287 | 6 | 0 |
| 229 Complete nights and days, | | 83,642 | 0 | 0 |
| Add | | 47 | 23 | 30 |
| | | 83,689 | 23 | 30 |
| Add | | | 24 | hours. |
| Mean nights and days, | | 83,690 | 23 | 30 |

| | | D. | H. | ' | '' | ''' |
|---|---|---|---|---|---|---|
| 2000 mean lunations | = | 59,061 | 4 | 25 | 0 | 0 |
| 800 | = | 23,624 | 11 | 22 | 0 | 0 |
| 30 | = | 885 | 22 | 1 | 34 | 30 |
| 4 | = | 118 | 2 | 56 | 12 | 36 |
| 2,834 | | 83,689 | 16 | 44 | 47 | 6 |
| Add | | | 12 hours. | | | |
| Mean nights and days, | | 83,690 | 4 | 44 | 47 | 6 |

| | D. | H. | ' | '' | ''' |
|---|---|---|---|---|---|
| Julian interval, | 83,690 | 23 | 30 | 0 | 0 |
| Lunar, | 83,690 | 4 | 44 | 47 | 6 |
| Difference, | — | 18 | 45 | 12 | 54 |

| | | | D. | H. | ' |
|---|---|---|---|---|---|
| VI. | B.C. 720. | September 1. | 20 | 30 | 0 |
| | B.C. 383. | December 23. | 7 | 20 | 0 |

Actual interval, 337 years, + 112 days, 10 H. 50 '

Lunations, 4,172.

| | | D. | H. | ′ |
|---|---|---|---|---|
| Remaining from the last leap year, | | | 6 | 0 |
| 300 mean Julian years | = | 109,575 | 0 | 0 |
| 30 | = | 10,957 | 12 | 0 |
| 7 | = | 2,556 | 18 | 0 |
| 337 Complete nights and days, | | 123,089 | 0 | 0 |
| Add | | 112 | 10 | 50 |
| | | 123,201 | 10 | 50 |
| Add | | | 24 hours. | |
| Mean nights and days, | | 123,202 | 10 | 50 |

| | | D. | H. | ′ | ″ | ‴ |
|---|---|---|---|---|---|---|
| 4000 mean lunations | = | 118,122 | 8 | 50 | 0 | 0 |
| 100 | = | 2,953 | 1 | 25 | 15 | 0 |
| 70 | = | 2,067 | 3 | 23 | 40 | 30 |
| 2 | = | 59 | 1 | 28 | 6 | 18 |
| 4,172 | | 123,201 | 15 | 7 | 1 | 48 |
| Add | | | 12 hours. | | | |
| Mean nights and days, | | 123,202 | 3 | 7 | 1 | 48 |

| | D. | H. | ′ | ″ | ‴ |
|---|---|---|---|---|---|
| Julian interval, | 123,202 | 10 | 50 | 0 | 0 |
| Lunar, | 123,202 | 3 | 7 | 1 | 48 |
| Difference, | — | 7 | 42 | 58 | 12 |

| | | | H. | ′ |
|---|---|---|---|---|
| VII. | B.C. 721. | March 19. | 21 | 30 |
| | B.C. 382. | June 18. | 21 | 6 |

Actual interval, 339 years, + 90 days, 23 H. 36 ′

Lunations, 4,196.

| | | D. | H. | ' |
|---|---|---|---|---|
| Remaining from the last leap year, | | | 0 | 0 |
| 300 mean Julian years, | = | 109,575 | 0 | 0 |
| 30 | = | 10,957 | 12 | 0 |
| 9 | = | 3,287 | 6 | 0 |
| 339 Complete nights and days, | | 123,819 | 0 | 0 |
| Add | | 90 | 23 | 36 |
| | | 123,909 | 23 | 36 |
| Add | | | 24 | hours. |
| Mean nights and days, | | 123,910 | 23 | 36 |

| | | D. | H. | ' | '' | ''' |
|---|---|---|---|---|---|---|
| 4000 mean lunations | = | 118,122 | 8 | 50 | 0 | 0 |
| 100 | = | 2,953 | 1 | 25 | 15 | 0 |
| 90 | = | 2,657 | 18 | 4 | 43 | 30 |
| 6 | = | 177 | 4 | 24 | 18 | 54 |
| 4,196 | | 123,910 | 8 | 44 | 17 | 24 |
| Add | | | 12 hours. | | | |
| Mean nights and days, | | 123,910 | 20 | 44 | 17 | 24 |

| | D. | H. | ' | '' | ''' |
|---|---|---|---|---|---|
| Julian interval, | 123,910 | 23 | 36 | 0 | 0 |
| Lunar, | 123,910 | 20 | 44 | 17 | 24 |
| Difference, | — | 2 | 51 | 42 | 36 |

| | | | H. | ' |
|---|---|---|---|---|
| VIII. | B.C. 720. | September 1. | 20 | 30 |
| | B.C. 382. | December 12. | 23 | |

| | | H. | ' |
|---|---|---|---|
| Actual interval, 338 years, + | 102 days, | 2 | 30 |

Lunations, 4,184.

| | | | D. | H. | ' |
|---|---|---|---|---|---|
| Remaining from the last leap year, | | | | 6 | 0 |
| 300 | mean Julian years, | = | 109,575 | 0 | 0 |
| 30 | | = | 10,957 | 12 | 0 |
| 8 | | = | 2,922 | 0 | 0 |
| 338 | Complete nights and days, | | 123,454 | 0 | 0 |
| | Add | | 102 | 2 | 30 |
| | | | 123,556 | 2 | 30 |
| | Add | | | 24 hours. | |
| | Mean nights and days, | | 123,557 | 2 | 30 |

| | | | D. | H. | ' | " | ''' |
|---|---|---|---|---|---|---|---|
| 4000 | mean lunations, | = | 118,122 | 8 | 50 | 0 | 0 |
| 100 | | = | 2,953 | 1 | 25 | 15 | 0 |
| 80 | | = | 2,362 | 10 | 44 | 12 | 0 |
| 4 | | = | 118 | 2 | 56 | 12 | 36 |
| 4,184 | | = | 123,555 | 23 | 55 | 39 | 36 |
| | | Add | | 12 hours. | | | |
| | Mean nights and days, | | 123,556 | 11 | 55 | 39 | 36 |

| | D. | H. | ' | " | ''' |
|---|---|---|---|---|---|
| Julian interval, | 123,557 | 2 | 30 | 0 | 0 |
| Lunar, | 123,556 | 11 | 55 | 39 | 36 |
| Difference, | — | 14 | 34 | 20 | 24 |

## SECTION IX.

### *On the coincidence between the date of the first Miracle and that of the second.*

It must be considered something extraordinary, that the date of the first of these miracles should be determinable by circumstances, to May 31, B.C. 1520, and that of the second to May 31, B.C. 710: on both which points I can speak, as I have hitherto spoken, with the utmost degree of confidence. It is extraordinary too, that the precise time of the first miracle should be determinable to May 31, at six A.M. of mean time, and that of the second, as nearly as possible, to six P.M. of mean time; that is, that the sun should have been fixed in one position, in the eastern horizon, for twelve hours, B.C. 1520, at six A.M. on May 31, and have been replaced in the eastern horizon, from the west, B.C. 710, to commence his daily career anew, as nearly as possible, as I collect, at 5h. 2m. P.M. May 31, also. It is singular too, that on the first of these occasions, the moon should have been only about twenty-four hours of mean time past the opposition; and on the second have been as nearly as possible arrived at the conjunction: and I think it would be worth the while of any competent person to calculate both the full moon of May 30, B.C. 1520, and the new moon of May 31, B.C. 710, for the meridian of the ancient Jerusalem, with all possible care and exactness. I calculated the former, by Ferguson's Rules, and determined it thereby to May 30, 8h. 4m. A.M. A much more competent person, at my request, calculated it also; and found it May 30, at two A.M. The most careful consideration of the historical circumstances, before and after, leads me to conclude it must really have happened, for the meridian in question, about six A.M. And in like manner, if the new moon of May 31, B.C. 710, were to be calculated, I am strongly inclined to think it would be found to have happened at five or six P.M. There are, therefore, these two cases; one of the lunar opposition, immediately before the first miracle, and the other of the lunar conjunction, synchronous with, or immediately after, the second; which seem to be the best and fittest that could be desired *a priori*, for the purpose of comparison: and I will, therefore, take the liberty of comparing them, on the hypothesis that the one of them happened May 30, six A.M., B.C. 1520; and the other, May 31, six P.M., B.C. 710.

---

| | | H. | ′ |
|---|---|---|---|
| B.C. 1520. | May 30. | 6 | 0 |
| B.C. 710. | May 31. | 18 | 0 |

Actual interval, 810 years, 1 day, 12 hours.

Lunations, 10,018½.

| | | D. | H. | ′ |
|---|---|---|---|---|
| Remaining from the last leap year, | | | 6 | 0 |
| 800 mean Julian years, | = | 292,200 | 0 | 0 |
| 10 | = | 3,652 | 12 | 0 |
| 810 In complete nights and days, | | 295,852 | 0 | 0 |
| Add | | 1 | 12 | 0 |
| | | 295,853 | 12 | 0 |

| | | D. | H. | ′ | ″ | ‴ |
|---|---|---|---|---|---|---|
| 10,000 mean lunations | = | 295,305 | 22 | 5 | 0 | 0 |
| 10 | = | 295 | 7 | 20 | 31 | 30 |
| 8 | = | 236 | 5 | 52 | 25 | 12 |
| 10,018 | = | 295,837 | 11 | 17 | 56 | 42 |
| Add ½ mean lunation, | | 14 | 18 | 22 | 1 | 34 |
| | | 295,852 | 5 | 39 | 58 | 16 |
| Add | | | 24 hours. | | | |
| | | 295,853 | 5 | 39 | 58 | 16 |

| | D. | H. | ′ | ″ | ‴ |
|---|---|---|---|---|---|
| Julian interval, | 295,853 | 12 | 0 | 0 | 0 |
| Lunar, | 295,853 | 5 | 39 | 58 | 16 |
| Difference, | — | 6 | 20 | 1 | 44 |

## SECTION X.

### *On the coincidence of the Chronological characters of* B.C. 4004, *and* B.C. 4.

If I were called upon to specify the most remarkable and the most important epochs, in the history of the course and succession of time in general; they would be the following:—B.C. 4004; B.C. 1520; B.C. 710; B.C. 672; B.C. 4; and A.D. 225.

Enough has been said to make it appear that B.C. 1520, B.C. 710, B.C. 672, and A.D. 225, are really of this description. With regard to the remaining two of the number, B.C. 4004, and B.C. 4: the former is the true year of the Mosaic creation, the true A.M. 1; in which each of the measures of time, both natural and civil, which are still in existence, or ever have been so, when traced back to its origin, and according to its proper law, is found to have taken its rise; all in one season of this year, the season of Spring; all in one month of this season, the month of April; and all in one week of this month, from April 25 at midnight, by the Julian reckoning, to May 2 at midnight; the nocti-diurnal, the hebdomadal, and the annual, (both natural and civil,) all together, on April 25 at midnight, with the point of the *feria prima*, and the point of the Vernal Equinox; the lunar, or monthly, at the proper distance from the *feria prima* at midnight, defined by Scripture itself, when the intimations of Scripture on that point come to be rightly understood. For it turns out to be the case, that the moon was first made to appear on the fourth day of the Hexaëmeron, not in syzygy, nor yet in opposition, (one of which two states of the case has been commonly supposed,) but exactly and critically at that period of the lunar revolution, and in that state of the lunar phasis, at which and in which she is visible for the last time in the morning, rising a little before the sun; that is, about thirty-six or thirty-seven hours of mean time before the change. And the moon having thus been caused to appear for the first time, about five A.M. April 28, on the *feria quarta*, was first brought into conjunction with the sun, at sunset, on April 29, the *feria quinta;* and first made visible to the human eye, at sunset on April 30, the *feria sexta*, the evening of the creation of man. Such I say, appears to have been the actual state of the case, with regard to the true epoch of lunar time; which as traced from the first actual appearance of the moon, would be April 28, at five A.M. the *feria quarta;* but as traced from the first actual syzygy or conjunction, which is the epoch assumed in my Tables, must be April 29 at six P.M., the *feria quinta.* And *all* these are natural measures of time; which thus meet together, and are thus seen to take their rise together, in this one week. It is equally true, that the civil or calendar measures, which have any where or at any time been substituted to the natural, when traced up to their origin, meet together in this one week too, and take their rise in this one week too; and all on the same day, April 25, the *feria prima*, at midnight.

With regard to B.C. 4, the first circumstance to be remarked about it is, That it is the true year of the Nativity; That our Lord Jesus Christ was born in this year, and in none other, before or after it; and at a certain season of this year, which like that of the Creation, was the season of Spring; and in a certain week of this season, which, like that of Creation, bordered closely on the Vernal Equinox. For the proof of these facts, I refer to my published Works: observing only, that I have met with fresh proofs of them since, which do not appear in those Works.

The next remarkable circumstance about this year is, That it stands at the distance of 4000 natural years complete, from B.C. 4004, that is, from the epoch of the Creation itself; and the first year of the world being B.C. 4004, the 4001st was B.C. 4. Now the standard of the natural year, assumed in my Tables, 365 days, 5h. 48m. 50sec. 24thds., is such, that 4000 natural years of this standard bring out an even number of days and nights, without any remainder; 1,460,969; just thirty-one days and nights less than the number contained in 4000 mean Julian years. It happens, then, that as these Tables of actual time set out from zero, A.M. 1, B.C. 4004; so they return to zero, A.M. 4001, B.C. 4: and as the mean Julian date of the first natural Vernal Ingress at that time, was April 25 at midnight, B.C. 4004; so the mean Julian date of the 4001st, is March 23 at midnight, B.C. 4: in other words, the actual date of the Vernal Ingress, B.C. 4004, being assumed as April 24, at 23h. 48m. 50sec. 24thds., from midnight, its actual date, B C. 4, is seen to be March 22, at 23h. 48m. 50sec. 24thds., from midnight also. March 23 too, B.C. 4, was the *feria prima* at midnight; just as April 25 was so, B.C. 4004. The new moon, also, for the meridian of Jerusalem, is seen to be falling the same year, cyclically, on March 27, the *feria quinta*, at eighteen hours from midnight; just as it did B.C. 4004, on April 29, eighteen hours from midnight too.

It appears, then, that as matter of fact, each of the actual measures of time, the nocti-diurnal, the hebdomadal, the annual, (both natural and civil,) and the lunar or menstrual, which began to proceed in conjunction, and under certain relations to each other, between April 25 and May 2, B.C. 4004, returned to those relations again, for the first time, without a shadow of difference in any essential respect, between March 23 and March 30, B.C. 4. This cannot but be regarded as a very extraordinary coincidence; especially when we further take into account the way in which it was brought about; viz., not in the natural course and succession of these measures of time themselves, each according to its proper law from the first, till then, (for this natural course of things could not have brought such an effect to pass, neither in 4000 years, nor in a thousand times four thousand years,) but purely and solely because of the interruption of that natural course of things, produced by these two miracles; which disturbed that natural course, as it was going on previously, and threw each of the cycles of time into fresh relations one to another; and thereby rendered that coincidence possible in 4000 years, which under other circumstances never could, nor ever would have been possible, almost in any compass of time, which could be mentioned.

The final end of this coincidence seems to be satisfactorily explained by the fact, which a true Gospel chronology brings to light; viz., that B.C. 4, A.M. 4001, was the particular year in which it was always foreknown, and always intended, that the Nativity should take place; combined with another, which though not fully cleared up, has yet been partially revealed; viz., that it was necessary Jesus Christ should be born at the end of 4000 natural years, from the Creation, complete; and that in the actual year of His birth, all the measures of time, in particular the natural, should return to the identical relations one to another, which they had been appointed to bear in the year of the Creation itself. For, account for the coincidence as we may, the fact still holds good; that these measures and these relations did meet once, in B.C. 4004, and do meet again, in B.C. 4; but never before or after: and that Jesus Christ was born on the tenth day of that moon, which was new on the fifth day after the Vernal Equinox, March 27, B.C. 4; that is, the tenth of the Jewish Nisan, April 5, the *feria septima;* just as, A.D. 30, thirty-three years after, he suffered on the fourteenth day of the same moon, the fourteenth of the Jewish Nisan, April 5, the *feria sexta.*

As then the chronological characters of these two years in particular, A.M. 1, B.C. 4004, and A.M. 4001, B.C. 4, agree in so remarkable a manner; and as the moral and religious and providential considerations, connected with each, are of so peculiar a kind; I have always felt an earnest desire to see the astronomical characters of each, subjected to the test of calculation, as far as the nature of the case would admit, by the solution of these four problems; viz., The date of the *mean* and of the *true* Vernal Equinox, for the meridian of Jerusalem, B.C. 4004 and B.C. 4: and also the date of the true and of the mean lunar conjunction, for the meridian of Jerusalem, in the month of April, B.C. 4004, and in the month of March, B.C. 4. I say, as far as the nature of the case would admit: for though either of these things might perhaps be attempted with a prospect of success, of B.C. 4, it is doubtful how far they could be, of B.C. 4004. At least, both Baillie, Delambre, and La Place seem to have agreed in one opinion, to the effect, That astronomy even in its present improved state, is not yet provided with formulæ which can be relied on implicitly in cases of this kind, for more than 2000 years back. What then must be thought of calculations carried nearly 6000 years back? calculations too, which by hypothesis must be assumed to go not to a point in the constant decursus of time before and after, but to the epoch, or starting point, of the decursus itself: which, it appears to me must add materially to the nicety and peculiarity of the problem, proposed for solution.

## SECTION XI.

### *On the existence of testimony to each or to either of the Miracles in question, extraneous to Scripture.*

If any one considers it necessary to ask for proof of both or of either of these miracles, over and above the testimony of Scripture; he is bound first of all to answer the question, What kind of proof he thinks he has a right to expect, in a case like this, distinct from and independent of the testimony of Scripture?

If he replies, The evidence of contemporaries: the attestation of eye-witnesses of each or of either of these phenomena at the time: it must be admitted that two such extraordinary phenomena could not possibly happen without being observed everywhere; without attracting attention; without exciting surprize and astonishment; without being long remembered; and even without being noted down and recorded in such notices and records of passing events, as might be kept at the time, everywhere. But the question will still occur, Where are these records to be found at present? The date of the first miracle was B.C. 1520: and whatsoever Egyptians, or Chinese, or Hindoos, or any other nation ancient or modern, may pretend or may produce to the contrary; B.C. 1520 goes far beyond the beginning of history, properly so called, out of the Bible, anywhere. Not a single event of this year, B.C. 1520, is or can be known, at present, except from Scripture.

The date of the second miracle was B.C. 710: and though that does not pass beyond the beginning of history, properly so called, distinct from Scripture; it is much earlier than the beginning of regular and continuous history anywhere. With the exception of one fact in Egyptian, and one fact in Chinese history, each of which I shall have occasion to particularize by and by, this year, B.C. 710, is just as much a blank as B.C. 1520. We might venture to say, That Gyges was reigning in Lydia in this year; Dejoces, in Media; Gjemschid, in Persia; Numa Pompilius, at Rome; and so forth: but that would be all. There is a segment of profane history, just before the date of the second miracle; and another just after it; each of which has been somewhat circumstantially related: viz., the first and the second Messenian wars of classical antiquity. But B.C. 710 falls critically between the two, in the midst of a period which is void of historical circumstances: for the first Messenian war ended B.C. 724, and the second began only B.C. 685.

It may be objected, however, that Tradition is sometimes competent to answer the purpose of History; and that in a case of this kind, traditional testimony was just as much to be expected beforehand as historical: and though this should be admitted; still the same question will have to be put, What kind of tradition we should have a right to expect, in a case like this? and whether an uniform tradition everywhere, and a tradition consistent with the simple truth, that is, the matter of fact, as related in Scripture, everywhere, or not?

Now, with respect to an uniform tradition, in a case like this, except in the same quarter of the globe, and among one and the same people; *a priori* it would be impossible. The difference of meridians would render it impossible. An addition of twelve hours to the length of the natural day, for one meridian, would be an addition of twelve hours to the length of the natural night for some other meridian; and tradition must have handed down the effect as it actually held good for one of these meridians, in a manner, at first sight, diametrically repugnant to the state of the case for the other. Under these circumstances, an uniform tradition of the fact of either of the miracles, in all quarters of the globe, and among all nations, (even if a tradition of any kind, relating to it, was beforehand to be expected,) would have been physically impossible: and the truest and most authentic tradition in one instance, must still have differed more or less even from the truest and most authentic in another.

In the next place, a tradition consistent with truth, in a case like this, and neither more nor less than the simple matter of fact, as related in Scripture, in all parts of the world, and among all nations; if not physically, would still be morally, impossible. It is found by experience in every case of this kind, that no matter of fact, committed to the custody of tradition merely, and handed down to posterity through that channel only, can long be kept free from perversion and misrepresentation. The tendency of tradition is to alter and modify, and commonly to distort and exaggerate everything; and the more so, the longer it continues, and the more extraordinary the matters of fact themselves, which are transmitted to posterity through this medium only. It may begin with history; but it almost invariably ends in fable.

And this leads me to observe, in the third place; That the annals of almost all nations, of which anything is known, do actually supply traditions, which, if they have any foundation in fact at all, must be one or other of these two miracles of Scripture, merely perverted, or misrepresented; exaggerated, distorted, and misapplied, from the natural and necessary tendency of tradition itself. The Chinese have a tradition of a sun, which did not set for ten days. The Persians had a tradition of a Mithras, which means a sun, thrice as long as usual. The Greeks had a tradition of a night-day, thrice the usual length; in which too they fabled the conception of Hercules. The question in all these cases, should be; On what real historical matter of fact might even such misrepresentations, or such misapplications of the truth as these, be founded? The most extravagant fable of antiquity presupposes something, currently reported and currently believed, to account even for its own origin and its own reception. It would be almost as unphilosophical to reject everything of this kind without discrimination, as to believe everything without hesitation; and just as wise as if the alchymist were to cast away the mass of ore, submitted to his analysis, before he has ascertained whether it does not contain a few grains of gold at least; because by far the greatest part of it was evidently base and spurious.

The Chinese tradition is referred in their books to the time of Yao; but that is no reason why it may not really go no further back than either of these miracles; on each of which occasions, the time of sunset was delayed twelve hours of mean time, or *ten hours* of kæric time: which this tradition has magnified into ten days. The Persian tradition, (inculcated, as we are told, in the mysteries of Mithras,) relating to the *τριπλάσιος Μίθρας*, cannot be older than the correction of their calendar; nor that than the date of the second miracle. The Grecian tradition of the *τριέσπερος*

*Ἡρακλῆς* appears to have been first related circumstantially by Pherecydes of Syros; who is commonly said to have been the preceptor of Pythagoras; and therefore would be the oldest authority for such a tradition, next to the poets, Homer, Arctinus, Eumelus, Callinus, Archilochus, and others; of none of whom, however, does any such tradition appear on record at present. Pherecydes of Syros must have been born little more than one hundred years later than the date of the second miracle: and he might have heard not only of that, but even of the much more ancient phenomenon of the same kind; the date of which would take him at once to the supposed time of Hercules, the greatest of the heroes of classical mythology: and out of the two, he would have little difficulty in forming his night-day of triple length, devoted to the conception of that hero in particular.

There are certain suppositions, in the Iliad and the Odyssey of Homer, also; which very probably would not have appeared there at present, if Homer too had not heard of some such thing before his own time, as a day or a night, actually made longer than usual. I am willing, however, to dismiss all these traditions as too doubtful to be seriously appealed to, in illustration or confirmation of a question of fact, of so much importance as this, which we are considering at present. There are still other traditions, of a much more authentic and unexceptionable kind; as well as certain matters of fact, which do not admit of being disputed; each of which will be found to furnish a distinct and independent testimony to the fact of one or other of these miracles, and in particular, to that of the second, over and above the testimony of Scripture.

As first; There is the tradition of the Egyptians, reported to Herodotus in Egypt, B.C. 444 or a little before that time, by the Egyptian priests. And here it is but just to premise, That, in a case of this kind, an Egyptian tradition was the only one calculated *a priori* to agree with the historical account of Scripture, and with the actual matter of fact. The principal school of astronomy in Egypt, if not the only school, both B.C. 1520 and B.C. 710, was the Scriptural On, the classical Heliopolis; not Thebes nor Memphis: but whether Memphis in particular, or Heliopolis, the meridian of either differed so little from that of the ancient Jerusalem, that the moment of sunrise or sunset at Jerusalem, B.C. 1520 or B.C. 710, within sixteen minutes of mean time only, would be the moment of sunrise or sunset at Heliopolis or at Memphis also.

Now Herodotus was told by the Egyptian priests, (ii. 142,) That between the time of Menes, the first king of Egypt, and that of Sethon, the priest of Vulcan; the sun had four times deviated from the order and course of nature, in the article of his *rising*, and (as the context of the passage implies,) in that of his *setting* also: *Ἐν τοίνυν τούτῳ τῷ χρόνῳ τετράκις ἔλεγον ἐξ ἠθέων τὸν ἥλιον ἀνατεῖλαι*: where the preposition *ἐξ* is used in the same sense as in the phrase *ἐξ ἀνθρώπων ἐγένετο*, which occurs elsewhere in Herodotus; and *ἐξ ἠθέων* is equivalent to *ἔξω τῶν ἠθέων*, or as Thomas Magister explains it, to *ἔξω τῆς συνηθείας*.

The general meaning of these words, however, at first sight, may appear to be, That the sun had four times *risen*, and *risen* only; not four times *risen* and *set*; in a manner different from usual. But their true meaning is, That the sun had *twice* so risen, and *twice* so set; four times in all: as is placed out of doubt by the explanation which follows: *Ἔνθα τε νῦν καταδύεται ἐνθεῦτεν δὶς ἐπαντεῖλαι· καὶ ἔνθα νῦν ἀνατέλλει ἐνθαῦτα δὶς καταδῦναι.*

Now though there is scarcely a chronologer of modern times, who has not had occasion to notice this Egyptian tradition; I know of no one, who has done simple justice to the tradition itself, or to Herodotus who reports it; much less to the testimony which it is calculated to render to the actual truth of the two miraculous facts, recorded in Scripture: and yet among these chronologers there have been some of the most acute and sagacious intellects, which were ever applied to such subjects; men, whose perceptions of the truth in other cases, much more obscure and recondite than this, appear to have had the quickness of intuition itself. Such is the force of prejudice, of long and inveterate prejudice; and no prejudice is of longer standing, or more inveterate, than that which has always existed against the simple, unhesitating, and unequivocal admission of each of these two miraculous facts, in its proper order of time; and according to the simple, and literal or grammatical, construction of the account of each in Scripture.

Some of these chronologers have pronounced this whole tradition a fable; and one of the most absurd and extravagant in all antiquity: some have conjectured that Herodotus misunderstood the Egyptian priests, and therefore has misrepresented their actual meaning: none appears to have ever thought of enquiring whether the tradition might not, after all, be only a summary account of two matters of fact, which, as Christian chronologers, they could not but know were to be read in Scripture; with no more of difference, or of misrepresentation, than under the circumstances of the case was to be expected, and at that distance of time, in fact, was almost unavoidable.

The authority of Scripture indeed, and its sole and sufficient testimony to the matter of fact recorded in each of these instances, stands in no need of confirmation from this Egyptian tradition; and yet this Egyptian tradition may derive both light and confirmation from Scripture: and to judge from the mystery which learned men have hitherto supposed to attach to it, it stands greatly in need of light and illustration from some such quarter as Scripture. Now, if the tradition had run in *these terms:* That, between such and such limits in point of time, the sun had *twice* been seen to be *rising*, WHEN he should have been *setting;* and *twice* observed to have been *setting*, WHEN he should have been *rising;* a more correct, and yet a more summary representation of the actual matter of fact, as it must have been witnessed at Heliopolis, on both the occasions in question; could scarcely be imagined. Is it, then, an objection, that, according to the actual tenor of the tradition, as reported by Herodotus, the sun was said to have twice been seen rising or setting *where*, not *when*, it should have been seen to be doing the contrary? I think not; especially when it is considered that, on the second occasion, (which was most likely to be the better remembered of the two,) the sun was actually seen rising *from* the west; and even, on the former occasion, it was still to be seen rising in the east, when it should have been seen setting in the west: and that, at the distance of more than a thousand years afterwards, might easily come to be represented as rising where it had been accustomed to set, and *vice versa.*

It is to be collected also, from the sequel of this account of Herodotus, that all these cases of the rising and the setting of the sun, different from usual, had happened in Egypt, and were still remembered to have happened, at the same season of the natural year, at which both the miracles in Scripture did; and this season, one which might suit to the actual date of each of the miracles in Scripture also, May 31: viz., that time of the year when the annual cycle of production begins to be renewed in Egypt, and the yearly phenomenon of the rise of the Nile is arrived, or at hand.

But there is no stronger internal evidence of the authenticity of this Egyptian tradition, in my opinion, nor of its actual reference to the two miraculous facts of Scripture, than the chronological limits prescribed by it to all these cases of departure from the laws of nature, in this one article of the rising and the setting of the sun; the reign of *Menes* on the one hand, and that of *Sethon* on the other. Menes was the first of the human kings of Egypt, in opposition to such as were supposed to be divine: and whether he was a real or a fictitious person, his time went far beyond the date of the miracle of Joshua. Sethon was contemporary with Hezekiah, each being alike a contemporary of Sennacherib's: Egypt, according to Herodotus, having been invaded by Sennacherib, in the time of Sethon, just as Judæa was, in the time of Hezekiah; and Egypt having been miraculously delivered from Sennacherib, in the time of Sethon, as Herodotus represents the matter of fact, (ii. 141,) just as Judæa was, in the time of Hezekiah.

Now the true date of this miraculous deliverance of Hezekiah was the beginning of B.C. 711. If Sethon, then, was living and reigning in Egypt early in B.C. 711; it may be presumed he was still living and reigning there, May 31, B.C. 710. As the first miracle, therefore, could not possibly have passed beyond one of the limits prescribed, the reign of Menes; so neither could the second have fallen short of the other, prescribed also, the reign of Sethon: and yet it approaches so nearly to the end of his reign, even while it still falls within it, that this may justly be regarded as a very critical coincidence, and a strong internal evidence of the truth of the coincidence itself.

This Egyptian tradition appears in Pomponius Mela also, (i. 9:) and yet with so much of difference from Herodotus' account of it, that he cannot be said to have taken it from Herodotus. It is asserted by Solinus too, (*Polyhistor*, xxxii. § 39,) that the natives of the torrid zone, bordering on Egypt, (the διακεκαυμένη as the ancients styled it,) the Troglodytes of classical Geography, preserved a tradition among them, which also recognized one or both of the Scriptural miracles, and most probably the second; when the sun was actually seen to rise from the west, and the west so far to have been turned into the east: A primis sibi gentis suæ avis traditum, ubi nunc occasus est, quondam ibi solis ortus fuisse. Diodorus Siculus, in like manner, reports (iii. 40,) that the Icthyophagi, (natives of these parts in general, but more in the neighbourhood of the sea-coast,) still retained even in his time, the memory of a sudden parting asunder of the Sinus Arabicus, which laid the bottom dry to a great extent: and this fact every simple-minded and unprejudiced reader of Scripture will at once refer to the miraculous division of the Red Sea, at the Exodus.

Secondly: The change in the epoch of the cycle of night and day, among the Persians and the Babylonians more particularly. We are informed by Servius, the commentator on Virgil, that the Persian rule of the night-day was to reckon it from sunrise to sunrise: but I should not consider the testimony of so late a writer as Servius, or of a mere grammarian like him, sufficient to establish this fact of anything but the rule of the Persians in his own time, which was that of the second Persian empire; were there not several facts on record, from the reign of Darius Hystaspis downwards, and even earlier, which implied the same thing of the old Persian rule itself; and if it were not still the rule of the modern Parsees, of Kerman and India, transmitted to them from the time of Zerdusht or Zoroaster himself.

It does not follow, however, even from this fact, that there was no popular rule of the night-day among the ancient Persians themselves, which agreed with the simple and primitive one, from sunset to sunset. This contrary rule, from sunrise to sunrise, appears to have been from the first, and still, in the use and observance of the Parsees, to be a purely religious one—purely liturgical or ritual: and therefore it cannot be traced further back than the origin of their purely religious or ecclesiastical system, which was first connected with their calendar, if it was not first brought into being, (for that is a more doubtful point,) at the epoch of the correction of Gjemschid; eight years at least later than the date of the second miracle.

Now, among the Persians, according to the system thus adopted, or thus introduced, by Gjemschid; each of the twelve months of the year, and each of the thirty days of the month, were under the regency or guardianship of the one Supreme Principle, which they styled *Ormuzd* or *Hormuzd*, and also *Dey;* and under that of thirty subordinate principles, inferior to him, though superior to man, which they called Yezeds or Izeds: or, to speak more correctly, under that of twenty-six such beings, and that of the Supreme Principle himself, and of three of these Izeds, associated in some manner or other with him, and bearing a name composed partly of his name of Dey, and partly of their own. Nor could any month, or any day of the month, in this system have more than one guardian or presiding principle. Each month bore the name of the Supreme Principle, or of one of the Izeds: and whosesoever name it bore, whether a month or a day it belonged wholly and entirely to him: and when I speak of a day in this system, I mean a period of twenty-four hours of mean or of apparent time, cyclically reckoned perpetually; and when of a month, I understand a period of thirty such cycles, similarly reckoned also.

Now the effect of the miracle of B.C. 710 was to draw back the epoch of the next cyclical period of this kind, from sunset to sunrise; or as *we* might express it, from six P.M. to six A.M.: the consequence of which could not fail to be, that the service of the particular Ized, which should have been in course at sunset, was found to be actually in course at sunrise; and if that was not to be terminated in half the usual time, at sunset again, the epoch of the night-day, for religious, liturgical, and ceremonial purposes, (whether for civil and popular purposes or not,) must be changed from sunset to sunrise; and every cyclical period of twenty-four hours, as belonging to each of the Izeds in its turn, must be reckoned thenceforward accordingly.

And what religious, liturgical, and ceremonial considerations of this kind, induced the Persians to do, in consequence of the second miracle; apotelesmatical or astrological reasons appear to have brought about at the same time in Chaldæa or Babylonia. That the Babylonians reckoned their night-day from sunrise to sunrise, is asserted by Pliny the Elder, and by Aulus Gellius, apparently after Varro; and by many others of later date: and though I know of no clear and decisive proof of this fact, distinct from their testimony to it, yet neither do I know of any reason to call it in question; and I think that the testimony of Varro and Pliny is competent to satisfy us of it.

But, among the Chaldæans, (who are generally represented as the authors of the ancient system of judicial astrology, and who, if not the inventors of it, were certainly the greatest proficients in it,) the regency of the months and of the days of the months was divided out to a number of principles, called Decani; three of which had the charge of the month, and each of the three that of ten days of the month in order. The relations of these Decani to their proper days could not be confounded or intermingled, in this astrological system of the Chaldæans, no more than those of the Izeds, in the theological system of the Persians. The same sense of necessity, then, would compel them to alter the epoch of their night-day, or cyclical period of twenty-four hours, in subserviency to this astrological system, which obliged the Persians to change theirs' in connection with their theological one. This, I think, is the true explanation of the change of the primitive rule of the night-day, among the Persians and the Babylonians in particular; though only in relation to these two systems respectively: and, therefore, being directly resolvable into the effect of the second miracle, the fact of this change itself is a proof of the fact of that miracle; without which it would probably never have taken place. We have the testimony of Scripture that this second miracle attracted attention at Babylon in particular, at the time; and that Merodach Baladan, the reigning king of Babylon, at the time, (whom some have conjectured to have been the Mardoc-Empadus of Ptolemy, though in reality he was a different person,) when he sent an embassy, to congratulate Hezekiah on his recovery from his sickness, sent to inquire also about the sign which had been done in the sun.

Thirdly: The Greek fable of Atreus and Thyestes, and of the incident connected with it, in the recession or going back of the sun. The whole story of the unnatural quarrel of Atreus and Thyestes, and of the consequences to which it gave birth, which the tragic drama of antiquity has rendered so familiar to classical readers, must be pronounced a mere invention and figment of later times; just as much as that of the sacrifice of Iphigenia; because both are unknown to Homer; and what is more, both are contradicted and disproved by his better testimony.

There are two principal circumstances in this story, however; The banquet of Thyestes on his own children, and the going back of the sun, in consequence of that banquet, and out of supposed horror or abomination, on the part of the sun, at the contemplation of such a banquet. The former is pure and unmixed fable: the latter is fabulous too, as a concomitant of the former; but not *per se*, nor in *any* sense; unless it could be shewn that no such thing as this going back of the sun, whether as a consequence of this banquet of Thyestes or not, ever took place; not even in the time of Hezekiah.

If we inquire into the history of these two parts of the same story, both individually and conjointly; we find no traces of either in antiquity anywhere, beyond the limits of the tragic drama: from which we may infer that both took their rise on the stage; and that both were invented or introduced there, for the same reasons in general; which must be ultimately resolvable into the adaptation of both to the purposes of tragedy, and to dramatic or stage effect. In Æschylus, the oldest of the Greek tragedians, the banquet is clearly recognized, but no going back of the sun, as connected with it in any manner whatsoever. In Sophocles, the next to Æschylus, we meet with no allusion to either. In Euripides, the youngest of the three, the state of the case, compared with what it appears in Æschylus, is reversed: the banquet is either not alluded to at all, or only by implication; the going back of the sun is prominently put forward and described: so that, if Æschylus would so far seem to have been the inventor of one part of the story, or the first to naturalize that upon the stage, Euripides would seem, with just as much reason, to have been the inventor of the other, or the first to combine that also with the still more extraordinary appendage of the going back of the sun; and the first to introduce both in conjunction upon the stage.

Now Euripides was born on the day of the battle of Salamis, Sept. 30, B.C. 480; two hundred and thirty years after the Scriptural miracle of the time of Hezekiah. It is not impossible that, even two hundred and thirty years after that event, some tradition or vestige of tradition of so extraordinary and remarkable a phenomenon, might still be preserved among the Greeks; which Euripides might seize on, and for various reasons connect with the popular fable, already in possession of the stage, of the quarrel of Atreus and Thyestes, and of the unnatural banquet of the latter on his own flesh and blood. It is still more probable, that out of the multitudinous host of Xerxes, which accompanied him in B.C. 480, containing not only Persians, but Egyptians, Babylonians, Tyrians, Sidonians, and if the poet Chœrilus, quoted by Josephus, is to be believed, even Jews, (all from parts of the east, where the last Scriptural miracle in particular is seen to have been long remembered,) many might be detained at Athens, ever after, in the condition of slaves, from whom the curious and philosophical Euripides, as he grew up, might often hear the wonderful and almost incredible story of this most extraordinary of natural phenomena, the going back of the sun from west to east. And be this as it may; it is clear from his manner of referring to both, that he was much more sceptical about the domestic feud of the sons of Pelops, and its unnatural consequences, (as indeed every educated person, who had merely read Homer, could not fail to be,) than about this particular natural phenomenon: for while he barely recognizes the former, he plainly and prominently sets forth the latter, at least in the Orestes; though in the Electra he makes the chorus disavow its belief in the recession also.

It is very observable, at least, that the circumstantial description of the phenomenon, both in the Orestes, (v. 995, *Dindorf.*) and in the Electra, (v. 726,) is so remarkably in unison with the actual matter of fact, B.C. 710; that if it had been expressly derived from an authentic tradition of the event, it could scarcely have been more agreeable to the truth. For 1st., the recession, in this description too, begins to take place at evening, just before sunset; the sun being already in the west, according to the description, when he is supposed to go back again to the east. And here, it is to be considered, that as the meridian of Athens was 48m. west of that of Jerusalem; if the sun began to go back about two hours and twenty minutes before sunset, for the meridian of Jerusalem, it would begin to do the same little more than one hour and an half before sunset, for the meridian of Athens. Secondly; the sun actually goes back from the west to the east, according to the description, as much as on the occasion of the reality; and the effect is the same in either case—the addition of twelve hours of mean time to the length of some one day: for whether it is so specified in the description or not, it must be implied even in *that*, that even after the sun has returned from the west to the east, in the first instance, he must still go back again from east to west, as before. Thirdly; the extent of the anomaly, on the occasion of the actual recession, was to affect the duration only of one day; and there is nothing, in the description of the same thing by Euripides to imply that the effect lasted more than one day, on that occasion too. The scholiasts and commentators of antiquity all remark upon the fact itself, that the recession is supposed to be only for *one* day; and some collect this from the terms of the description; others assign very absurd reasons why it should be so; particularly those who resolve this fable of the recession, into some physical astronomical truth, which they pretend to have been first discovered by Atreus; as, for instance, that of the real motion of the sun, in the contrary direction to the apparent motion of the heavens.

Fourthly; And this is one of the most significant of all the peculiarities in the description; the time of the year at which the recession takes place according to Euripides, is exactly the same as that, at which the actual miracle took place, B.C. 710. This is to be collected from the fact, that, according to the description, the Pleiads go back, from west to east, on the same occasion, as well as the sun; from which it follows, that they were previously in the west as well as the sun; and consequently were either in conjunction with the sun, and setting along with it, or preceding the sun, and setting before it. The supposed juncture of the recession, then, in the poetical description of it by Euripides, is either the cosmical or the heliacal rising of the Pleiads: and in either case the season of the year is thereby determined to the spring.

The Solar Parapegma of Meton was published at Athens, along with his Lunar Calendar, in B.C. 432; twenty-six or twenty-seven years before the death of Euripides; though it was not adopted there till B.C. 425: and in this solar calendar the cosmical rising of the Pleiads was dated April 2, the heliacal rising May 6: and both in this calendar, and in every solar and sidereal calendar of antiquity besides, which has come down to posterity, the heliacal rising of this constellation is assumed as the natural termination of the spring, and the natural beginning of the summer quarter of the year. The true date of the miracle, May 31 B.C. 710, was later than either of these terms: and whether either of them was rightly or wrongly assumed *per se*, for the meridian of Athens, and for the particular epoch of B.C. 432, will make no difference in this respect. It is well known that Hesiod specifies the heliacal rising of the Pleiads, as the natural symptom of the ripeness of barley harvest, for the meridian of Ascra in Bœtia, and for his own time: and assuming this to have been about B.C. 800, Mr. Ideler has calculated both the cosmical and the heliacal rising in question, for the parallel of 38°; and has determined the former to have been April 4, and the latter May 19. Hesiod's actual age, though much later than B.C. 800, has nothing to do with the truth of these calculations; which would hold good for B.C. 710, as much as for B.C. 800; or at the utmost, could be only one day in defect, ninety years later.

## SECTION XII.

### *Eclipses of the Tchun-tsieou.*

The Chinese philosopher Confucius, it is supposed, was born B.C. 551 or 550. There is a production of his extant, entitled Tchun-tsieou; which is universally allowed to be genuine; and by the most competent modern authorities it is considered to be one of the most authentic Works in the Chinese language. In this Work, we have an account of *thirty-six* solar eclipses; all apparently from observation. For the particulars of each of these, according to the literal version of the original, I refer to the forty-fifth volume of the Memoirs of the French Academy; and to the Dissertation of Mons. De Guignes, (page 207, sqq.) expressly devoted to this subject.

These eclipses are characterized 1st., By the years of the reigning kings: 2ndly, By the numerical order of the moons in the year, as first, second, third, or the like: 3rdly, By the place of these moons in the seasons of the year, spring, summer, autumn, or winter; 4thly, By the date of the day of the eclipse in the sixty-day cycle; which we may call the sexagesimal character, or sexagesimal feria. The first of these characters, for two reasons, may be somewhat uncertain: 1st., because Confucius' reigns in the Tchun-tsieou are not those of the general history of China, but contemporary reigns, and in a different part of the empire; 2ndly, because the beginning and the ending of such reigns, older than the time of Confucius, can never be determined at present to the year, by the aid of contemporary history only. But the other three are or ought to be much more determinate: especially that of the numerical order of the moon, and that of the sexagesimal feria.

The learned and indefatigable missionaries in China, to whose labours and researches the history and antiquities of that country are so much indebted, (especially Souciet and Gaubil,) have taken it for granted, that the lunar calendar, of the time of Confucius, or of the times to which these observations refer, and the sexagesimal cycle also, *mutatis mutandis* were absolutely one and the same with the lunar calendar, and with the sexagesimal cycle, of their own time. This assumption was a great mistake: and it could not fail to lead them wrong, in their attempts to verify and confirm these eclipses in particular.

The truth is, that even in the Tchun-tsieou of Confucius itself, the moons which it mentions are almost all referred by name to a calendar, which it styles the *Royal Calendar;* an allusion or designation, which appears to have perplexed the most learned of the Chinese themselves, just as much as the Jesuits: this royal calendar of Confucius being altogether different from anything of the kind with which they were acquainted; and as comparison and collation of the two together demonstrated, incapable of being reduced to the traditional lunar calendar of their country in particular, without the utmost violence, and without taking all manner of liberties with it, and allowing free scope and license to conjectural alterations, under the name of corrections of the text of the Tchun-tsieou itself.

The fact is, that this royal calendar of Confucius was the Apis cycle; that form of the lunar, which was naturally best adapted to the primitive or cyclical form of the solar, calendar; and which almost every nation of antiquity, which continued to use the cyclical form of the solar reckoning, with the least change or modification from first to last, is seen to have adopted in conjunction with it, sooner or later. The date of this cycle among the Egyptians was B.C. 973; and this Egyptian cycle appears to have been the oldest of the kind, which is anywhere to be met with: among the Babylonians, it was B.C. 746: among the Chinese, B.C. 742: and it was fixed at that time in China to the 2nd of Thoth, which coincided with February 25. This I say is the royal calendar of Confucius. It is the Apis cycle, first introduced into use among the Chinese, in B.C. 742, answering to Nabon, 6; and first adapted to their solar and cyclical calendar, through the common date of Thoth 2, Nab. 6; February 25, B.C. 742. All the moons, and all the eclipses too, of the Tchun-tsieou are to be reduced to this cycle: and as so reduced, (though from the state of the text of the Tchun-tsieou at present, and from the corruptions to which it has been so long exposed, and from other causes which it is not necessary to particularize at this moment, there may still be difficulties connected with some of these eclipses,) in general, they will not be found to fail.

And with regard to the sexagesimal characters assigned to these moons and to these eclipses also: the Chinese have a double sexagesimal cycle at present; a cycle of sixty days, and a cycle of sixty years: and both these, as they have been used in conjunction ever since, took their rise at the same point of time; which was that of the first introduction of their lunar calendar, at present in use: February 16, B.C. 657. I have not been able to discover that the sixty years' cycle in particular had any existence, or in any shape, before this date; whatsoever the Chinese themselves may pretend to the contrary: but the sixty days' cycle does appear to have been previously in existence: though not from so remote a point of time as the Chinese themselves assign to this cycle also. It goes back to the epoch of their royal calendar, or Apis cycle; but no further: only that instead of being originally attached to the proper lunar epoch of this calendar, the 2nd of Thoth, Nab. 6, February 25, B.C. 742, it was attached to the first epagomene, Nab. 5; February 19, the same year. The reason of this distinction was, that this cycle was *a priori* adapted to a year of 360 days, rather than to one of 365; and therefore its natural epoch, in a year of the latter description, was much more properly the first epagomene, than the first of Thoth.

The sixty-day cycle at present in use among the

Chinese, was derived from this older and original one; but not before B.C. 657. It was a fatal mistake of the Jesuits to carry it back to the beginning of these eclipses of the Tchun-tsieou; just as much as to carry back the present lunar calendar of the Chinese beyond B.C. 657 also. I cannot, however, enter at present, on every explanation which might be necessary, fully to clear up this point. Suffice it to say; That even B.C. 657, when the sexagesimal cycle of Confucius and the sixty-day cycle, at present in use, began actually to proceed in conjunction; there was still a difference of *eight* days between them; so that any agreement of the sexagesimal feriæ of the one, and of the corresponding feriæ of the other, without an allowance to that extent on either side, even from the first, was impossible.

Now the second of the eclipses in the Tchun-tsieou is described as a *total eclipse* of the sun, in *such* a year of *such* a reign, in the *seventh* moon, (which is further defined as one of the moons of *autumn,)* and on the sexagesimal feria, which in the Chinese notation of those feriæ is called *Dsjin-tschin,* and in the numerical order of the cycle answers to the 29th. It has been supposed by Gaubil, that these characters all met in the 17th of July, B.C. 709: in which year, and on which day, there was a solar eclipse, for the meridian of Paris, at 8. 45. P.M. It is here to be observed, that the meridian of each of these eclipses of Confucius, is not specified. It seems, however, to have been understood by Gaubil, that this eclipse in particular, must have been referred to the meridian of Cai-fon-su; which it appears from Delambre, (Astronomie Ancienne, i. 366,) was 2° 3m. 15sec. *west* of Pekin: and he has calculated an ecliptic conjunction for that meridian, the date of which was July 17, 3h. 5m. B.C. 709, (Delambre, i. 364.) I know not at present, on what authority this meridian was assumed. But in any case, a lunar or ecliptic conjunction, referred to the Apis cycle of the epoch of February 25, B.C. 742, and to the sexagesimal cycle of the epoch of February 19, B.C. 742, also; is not to be explained by the lunar calendar of the epoch of February 16, or by the sexagesimal cycle of the same date, B.C. 657.

It has been already observed, that the succession of the reigns in the Tchun-tsieou can never be determined to a *year*, by the testimony of contemporary history merely: and therefore, the particular year of the particular reign to which this second eclipse is referred, may have been B.C. 710, just as probably as B.C. 709. It is purely on account of the eclipse of July 17, the same year, that it is referred to this year by the Jesuits themselves. Let the Apis cycle then, for the time being, be applied to B.C. 710.

The first cycle of this denomination in China bearing date Thoth 2, Nab. 6, the second would bear date Thoth 2, Nab. 31: and the seventh year of this cycle would begin to be reckoned on Paüni 22, Nab. 37: and whatsoever was the rule of alternation in this calendar, with respect to the length of the lunations themselves, whether twenty-nine and thirty, or thirty and twenty-nine days each; from the first to the seventh, in this particular year, they would necessarily run as follows.

Chinese Apis Cycle, Cycle ii. 7.

Nabon. 37—38.

| | | | | | |
|---|---|---|---|---|---|
| i. month | 30 days, | Paüni 22. | iv. month | 29 days, | Thoth 16. |
| ii. — | 29 days, | Epiphi 22. | v. — | 30 days, | Phaophi 15. |
| iii. — | 30 days, | Mesore 21. | vi. — | 29 days, | Athyr 15. |

vii. month Chœac 14.

The solar calendar, for the latter part of the same year, would stand as follows.

Chinese Solar or Cyclical Calendar.

Thoth 1, Nab. 38. February 17, B.C. 710.

| | | | | |
|---|---|---|---|---|
| i. month, | Thoth | 1. | February | 17. |
| ii. | — | Phaophi 1. | March | 19. |
| iii. | — | Athyr 1. | April | 18. |
| iv. | — | Chœac 1. | May | 18. |

14 Chœac, May 31.

It thus appears, that the date of the seventh lunation, in the Apis cycle of this year, was May 31: and it has been already explained that May 31 was the actual date of the second conjunction in May, B.C. 710: and this would be as true of the date of that conjunction for any part of China, as for any part of Judæa. It is clear, then, that it might be truly represented as the date of one of the moons of this year, even in the royal calendar of Confucius: only under its proper Apis date.

It may be objected, however, that Confucius designates this moon as one of the moons of autumn. But this objection would not be more applicable, under any circumstances, to a conjunction of the date of May 31, than to one of that of July 17; of which Gaubil, and the rest of the learned in Chinese astronomy, have hitherto understood this one of the Tchun-tsieou in particular. The real explanation of this difficulty, however, is that the distribution of moons among the seasons of the natural year, in this royal calendar of Confucius, (which we have discovered to be neither more nor less than a particular form of the Apis cycle,) follows a technical or positive rule; whereby, the reckoning of all of them in general beginning with the spring, every three in order are supposed to belong to a different season of the year; the first three to the spring; the next three to the summer; and so on: agreeably to which rule, the seventh month of the cycle must necessarily be reckoned the first of the months of autumn. And though this division, so stated, appears to be arbitrary, and no longer true to nature; it is in perfect accordance with the genius of a cyclical lunar calendar, like the Apis; and if it be referred to the epoch of the cycle in the first instance, as it ought to be, February 25, B.C. 742; it is seen to be true to nature itself: for February 25, B.C. 742, would be as nearly as possible the actual beginning of spring in China. It was considered sufficient, therefore, that this distribution of the moons of the cycle, among the seasons, was agreeable to the actual matter of fact in the first instance of all; and would be so, periodically at least, for a long time after, with the recurrence of the cycle to its original relations every twenty-five years.

It remains still to consider the sexagesimal character of this conjunction. In the year of 365 days, the sexagesimal feriæ rise five days every year, perpetually; and so come round to the same order again, in twelve such years exactly. The 1st of Thoth, Nab. 31, February 19, B.C. 717, was the 11th feria of this cycle: and the 1st of Thoth, Nab. 38, Feb. 17, B.C. 710, was the 46th feria.

| | | |
|---|---|---|
| Nab. 38, Thoth 1. | B.C. 710, Feb. 17. | Feria 46. |
| Add 103. | Add 103. | Add 103. |
| Chœac 14. | May 31. | Feria 29. |

It seems, then, that Chœac 14, the date of the seventh lunation in the seventh year of the current Apis cycle of the Chinese, Nabon 37 — 38, and the first of the moons of autumn, (according to the rule of the appropriation of the moons to the seasons, followed in that cycle,) did actually coincide with the twenty-ninth sexagesimal feria, for the time being, also: and that the Julian date, answering to the 14th of Chœac, Nab. 38, was May 31, B.C. 710. It follows that these characters and notes of distinction all met in the Julian May 31, B.C. 710, as much as in the Nabonassarian

Chœac 14, Nab. 38. Now this must appear a very remarkable coincidence; especially when it is further considered that the Julian May 31, B.C. 710, was also the actual date of the actual Scriptural miracle in the time of Hezekiah; and consequently that all the notes and characteristics, which met in the date of this second solar eclipse of the Tchun-tsieou, met in the date of this Scriptural miracle likewise. It is so remarkable, that it does not seem possible to account for it by chance, or a combination of fortuitous circumstances; though chance and a combination of accidents will sometimes account for much.

It is certain, of this Julian date of the Scriptural miracle, May 31, B.C. 710, that it was, and that it must have been, the date of an actual lunar and solar conjunction even in China; and therefore a day, on which it was possible *a priori* that there might be a solar eclipse even in China. The question is, however, whether any one has yet been able to discover a solar eclipse on that particular day, even in China? much more a total eclipse of the sun — and whether such a phenomenon as a solar eclipse of any kind, in the natural course of things, is capable of being discovered in that year, and on that day, even in China, by any calculation which might be instituted at present? For if not; it becomes a serious consideration, what we are to understand by the testimony of the Tchun-tsieou, (given so circumstantially, and authenticated by so many marks and evidences of truth,) to the fact of a *total* eclipse of the sun, on that day, in China; the only such eclipse also, except one, which is specified in the Tchun-tsieou, for two hundred and fifteen years: or how we are to explain it.

The Scriptural miracle of the time of Hezekiah will explain it; but nothing else will. Let the circumstances of that event, as they first and properly held good of Jerusalem, be applied to the meridian of any place in China; as, for instance, Cai-fon-su; which being 8min. or 9min. west of Pekin, would be 5h. 17m. or thereabouts, east of Jerusalem. If the sun began to go back in the heavens, for the meridian of Jerusalem, at or about 4h. 38m. P.M.; for the meridian of Cai-fon-su, it would begin to recede about 39m. before noon: and in 12m. of mean time at the utmost, after the beginning of that recession, as we may calculate the effect, there would be total darkness at Cai-fon-su; and darkness which would last almost six hours before daylight would begin to dawn again; the latitude of Cai-fon-su being 34° 52m. and consequently the length of the day, May 31, B.C. 710, little more than thirteen hours of mean time.

Now, what must have been thought of such a phenomenon as this, in China? where the true cause of the phenomenon, at the time, could not possibly be known—where no one could be expecting such an occurrence as total darkness, setting in at noon, and darkness for six hours—but where it might be, and it must, have been known, notwithstanding, that the moon and the sun were in conjunction, or as nearly as possible in conjunction; and consequently the former in a condition to eclipse the latter. Surely the miracle must pass *there* for an *eclipse* of the sun; and however extraordinary in its circumstances, and unexampled in point of magnitude and intensity, for an eclipse not unnatural in point of time; a total eclipse of the sun, indeed, of unusual duration, but brought about, at least, or observed to come on, at the usual time when all such phenomena in general had always been known to happen; viz., at the conjunction of the moon and the sun. We should thus account for its passing into the list of Confucius, not more than two hundred and fifteen years afterwards; and for its appearing therein at this day, attested and authenticated by every circumstantial criterion, which held good of the matter of fact at the time, and in error in one respect only; that of being classed with the ordinary eclipses of the sun, recorded in the same list: an error, however, which under the circumstances of the case, could scarcely fail to take place, and therefore may very well be excused.

After this proof, (from the testimony of contemporary experience, and from sensible observation in China,) of the actual matter of fact in one of these instances, that of May 31, B.C. 710; it would be carrying scepticism to a very unreasonable extent, if we refused to believe in the similar matter of fact on the former occasion, unless that too could be confirmed by similar evidence; though it goes nearly one thousand years further back into antiquity. The testimony of Scripture is, or ought to be, sufficient for the proof of any thing to which it is given. It is a disparagement to this sufficiency, and an injury done to the truth itself, to suppose that Scripture does, or can, stand in need of confirmation or corroboration of any kind, beyond itself; though it is the misfortune of many minds, that they cannot or will not see this: and for the satisfaction of such minds, we are compelled to demonstrate the truth of Scripture even *ex abundanti;* and while we protest against such an appeal in principle, we are reduced to appeal even to human testimony, in confirmation of divine. And there are still some curious and interesting remarks, to be made on this second miracle of Scripture, in connection with the eclipses recorded, or supposed to be recorded, among the Chinese; which, for the further conviction of such minds as labour under this peculiar bias, it is worth while to subjoin.

As first; Every one, perhaps, has heard or read of the famous solar eclipse in Chinese history, which the royal astronomers of the time, *Hi* and *Ho,* having neglected to calculate beforehand, that is to foresee and to announce accordingly; it came both on king and on people by surprize: for which failure of the duty incumbent upon them, and as a warning to all their successors in the same office, these two astronomers were put to death. In the books of the Chinese, the date of this event is set back to a period of incredible antiquity: and it is only one, among many other proofs of the same thing, to what extent credulity on the one hand, and scepticism on the other, may be combined together; that so many learned men of modern times have placed implicit reliance on the truth of this Chinese fable; and have seriously endeavoured to find the eclipse of which it spoke, at a period in the history of mankind, at which it never could be found, consistently with the truth of the Bible. In calling this tradition, however, a fable; I mean only, with respect to the antiquity assigned it, and the distance of time to which the Chinese pretend to carry it back. With respect to the matter of fact itself, I am not prepared to say that there is no real historical foundation for the tradition that an eclipse, or supposed eclipse, of the sun having come on the king and the people of China unawares; it excited so much surprize and consternation, that the astronomers, who should have apprized them of it beforehand, by a summary act of justice, or supposed justice, were put to death. But, does not every one perceive, that the extraordinary eclipse of May 31, B.C. 710, would be just the eclipse to produce this effect? and to answer to this description? What phenomenon, in the shape of an eclipse, would be more surprizing? what could create greater consternation? yet what could have been so little foreseen? what was more likely, then, to be visited on the heads of the astronomers, yet without any offence or fault of their own?

The circumstances of this traditionary eclipse too, with more or less of variation, have been handed down; and they agree, as nearly as was to be expected in a case like this, to the actual circumstances of the preternatural eclipse of May 31, B.C. 710. For example, according to Lord Macartney, (Embassy, vol. ii. 557,) this eclipse happened at noon: and we have seen, that for the meridian of Cai-fon-su, or Pekin in particular, the preternatural darkness, May 31 B.C. 710, would set in about noon. It is true, that according to the account of the Chou-king, which is generally quoted as the oldest written authority for this eclipse, (see Delambre, i. 350—353,) it is dated at eight in the morning. But the Chou-king in its present form, it is agreed, is not the original document of that name; but one which was recovered from memory, after the destruction of the original, and was taken down from the mouth of an aged Chinese Doctor, who pretended to remember it all. There is a Tatar translation of the Chou-king, (Delambre, i. 353,) in which the time of the day, when this eclipse happened, is not specified at all. It is to be considered, however, whether in the vast extent of the Chinese empire, there might not be meridians, at which the preternatural darkness of May 31 B.C. 710, might set in at eight in the morning, as much as others, at which it might begin at noon; in which case, both these dates may be true, though of different meridians merely. The Chinese tradition, of the sun which did not set for ten days, makes in favour of this supposition; at least, if that tradition be referred to the first miracle of Scripture, and the ten days be understood of ten hours. The meridian to which such a tradition as this must be referred, must have been ten hours later than that of Jerusalem; and referred to such a meridian as that, a phenomenon which occurred at Jerusalem one or two hours before sunset, would occur one or two hours after sunrise; and therefore might truly have happened about eight in the morning there, as much as about 4h. 38m. in the afternoon, at Jerusalem.

Again; this traditionary eclipse of Hi and Ho is dated at the autumnal equinox; and when the moon and the sun were in conjunction in *Fang*, which is the Chinese name for Scorpio, or for one or more of the stars in the forehead of Scorpio. But the tradition is a little inconsistent here too: one account representing the conjunction as taking place *in Fang*, another as taking place *out of Fang*. It may be said, however, that an ecliptic conjunction under any circumstances, and whether within or without *Fang*, at the autumnal equinox, must be fatal to the hypothesis, which understands this eclipse of the conjunction of May 31, B.C. 710; so much nearer to the vernal equinox. The answer to this objection is, that the true lunar date of the eclipse, May 31 B.C. 710, was the first of the seventh month; which, by the rule of the calendar at the time, passed for the first of the months of autumn: and therefore nominally for one at or about the autumnal equinox. According to a Table, given in Delambre, (i. 380,) the longitude of Fang, A.D. 1683, was 7s. 28° 31m.; so that allowance being made for a precession of 2339 years, its longitude, B.C. 657, at the epoch of the modern lunar calendar, would be about 6s. 26° 31m.; and it may very well admit of a question, whether, as referred to this calendar, the conjunction in question might not be truly described both as without the constellation Fang, at one time, and as within it, at another.*

In the next place; Though the lunar observations of the Chinese have been thus supposed by learned men, to extend over a period of 3858 years, (Delambre, i. 346,) there is only one lunar eclipse on record, as observed by them; (i. 389;) and yet there is a very long list of solar eclipses, beginning B.C. 710; which any one may see in Delambre, (i. 350—357: 386—390.) In this respect, the ecliptic observations of the Chinese stand singularly contrasted with those of the Chaldeans: though both appear to have begun very much about the same time, B.C. 746 and B.C. 742 respectively. In the case of the Chaldeans, we may ascribe this distinction to the imperfection of their astronomy; in the science of which they were still much inferior to the Egyptians, B.C. 746: for Diodorus Siculus tells us, they purposely abstained from the calculation of solar eclipses, under an idea that they were too difficult and too uncertain, to be determined. In the case of the Chinese, nothing is so capable of accounting for it, as this memorable eclipse of May 31, B.C. 710, and the fate of the two astronomers *Hi* and *Ho*. That lesson would not be lost on their successors; and its natural tendency would be to make them a thousand times more careful about solar, than about lunar eclipses. Add to this, the superstitious terror of such phenomena in particular, inspired by the experience of that of May 31, B.C. 710. It is easy to see, under such circumstances, that lunar eclipses might be comparatively neglected or overlooked; but not so solar. The first might be observed, and no doubt were so, as they occurred; but no one seems to have thought it worth his while to record them, and transmit them to posterity; whereas everything of the latter description appears to have been carefully noted down all along, and kept in mind ever after.

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* According to Lord Macartney, (Embassy, loc. cit.) the Chinese dated this conjunction at the *ninth* moon. If their lunar calendar of the date of February 16, B.C. 657, had been already in use, B.C. 710, the first moon would have borne date on February 2: the ninth on September 26.

The V. E. B.C. 710, by my General Tables, was bearing date March 30, 11h. 7m. 48sec. from midnight. The length of the spring and the summer quarters at that time was 186 days, 3h. 3m. 31sec. 15thds.; whence we obtain the A. E. for the meridian of Pekin, October 2, 19h. 36m. 18sec. 15thds., and the sun would attain to the 26° or 27° of Libra, October 27 or 28. The ninth lunar conjunction, then, B.C. 710, according to the calendar of after times, must have been strictly *without* the constellation Fang: the tenth only would be the first at that time to fall *within* it. The ninth, however, would be the nearest that year to the autumnal equinox: and that seems to have been the reason why this lunation was fixed upon.

## SECTION XIII.

### *On the probable effect of each of the two Miracles on the Precession of the Equinoxes.*

The phrase Precession of the Exquinoxes, is as common in the idiom of astronomy, as in that of chronology; though in the chronological sense, it means only the anticipation of the mean natural on the Julian year; but in the astronomical, it stands for an actual retrograde movement of the intersection of the plane of the ecliptic and the plane of the equator; which, as far as I understand it, does not affect the length of the mean natural year, but does affect the longitude of the fixed stars, or the distance of any fixed point, (which might be assumed on the plane of the ecliptic eastward,) from the point of the intersection in question, one year after another, perpetually.

Now precession in the chronological sense, being called precession in time, and in the astronomical, precession in space; the first remark which we may make upon both, is this; That whether there is any necessary connection between these two things, or any discoverable by ourselves at present, or not—in point of fact, they are connected, and always have been; and there is a certain proportion between them, which holds good as matter of fact perpetually. Precession in time being measured by days, and precession in space by degrees; this proportion is such, that the latter is nearly double the former; and if precession in time amounted to one day and night in 143 years, it would be just double: for precession in space, at the rate of 50sec. 20thds., annually, amounts to two degrees in 143 years.

Now, this being the case; it cannot be treated as an improbable, and much less as an impossible supposition, *a priori,* that when an addition was made, on each of two different occasions, to the stated annual amount of precession in time, a similar or proportionable addition might be made, on each of the same occasions also, to the stated annual amount of precession in space. The question will be only, In what manner this was most likely to be brought about? whether as a natural and necessary consequence of each of the miracles themselves, or by a direct and positive appointment? and what evidence we may have at present, of the fact of such an addition, even supposing it to have taken place?

In answer to this question, all that I will venture to say is; That, as far as I have been able to learn, there are two physical causes of this annual phenomenon, which astronomers call the Precession; the greater accumulation of matter at the equator, and the greater attraction of the sun and the moon, (not to mention that of the planets also,) on this greater accumulation of matter at the equator, than on any other part of the surface of the earth. With respect to the first of these causes, the greater accumulation of matter at the equator; it appears to be resolved ultimately into the centrifugal tendency, which accompanies the motion of all material bodies round a centre; and consequently must have accompanied the rotation of the earth about its own axis from the first. I would ask, however, of more competent persons than myself; Whether the accumulation of matter at the equator, so produced, goes on increasing, the longer the motion of the earth around its axis goes on continuing? for if it does not; then, it seems to me, we must suppose this particular consequence of the centrifugal tendency in question, in the case of the motion of the earth about itself, to have been sometime produced *once for all;* and therefore when the impulse of rotation was first communicated to the earth; which is in fact, the point of time when the revolution of night and day first began. I will not venture to answer this question for myself. I will observe only, that all astronomers appear to assume the annual amount of precession as a *constant* quantity; though they may differ as to the precise amount of the quantity itself: and that being the case, it seems to me to follow from this fact, That the absolute quantity of matter at the equator must be constant also; and cannot go on increasing, the longer the rotation of the earth continues.

If no addition however to the accumulation of matter at the equator was going on, in the natural course of things, before the occurrence of either of the miracles of Scripture; was anything of the kind to be expected, in consequence of either of those miracles? I fear it is presumptuous to hazard an opinion on such a subject: but if I may be permitted to do so, without incurring any such charge as that, I humbly conceive, it would be more agreeable to analogy, and to the course of nature before and after, that none should be made, in consequence of either of those miracles—even though the divine power itself should be supposed to have been directly interposed to prevent such an effect; especially on the second occasion—when the motion of the earth about its axis was not stopped, but reversed, and a new impulse of rotation, in the opposite direction, and with a velocity of 48min. instead of 24h. for a limited time was communicated to it.

With regard to the attraction of the sun and the moon; even though the absolute quantity of matter exposed to this attraction were supposed to have remained the same, still there would certainly be something peculiar in the position of the sun and the moon, relatively to the earth, both May 31 B.C. 1520, and May 31 B.C 710; and something still more so in the circumstances under which the earth itself would be exposed to this attraction, on each of the same occasions; viz., with its ordinary motion about its own axis suspended on the one, and not suspended merely, but reversed, and with a velocity much increased, on the other. There would be something peculiar too, in the fact that the motion of the moon, about the earth, was suspended on each of these occasions also. An astronomer would no doubt take all these things carefully into his consideration, before he came to his own conclusion, whether any new feature in the annual phenomenon of the precession, *ceteris paribus*, was to be expected from this change of circumstances merely.

I will not presume to anticipate the opinion of much more competent persons than myself, on such a question as this. But should it even turn out to be decided in the negative; still it will have to be considered last of all, Whether some change in the annual phenomenon of precession was not to be expected, on each of the same occasions, as the effect and consequence of a *direct appointment;* as something which the Author of the miracle, and of all its consequences in every other respect, might think fit to ordain as a consequence of it in this respect also.

We know not, indeed, what connection there may be *a priori* between duration and space, or between time and place; but we know that *de facto* there is such a connection; that motion in space, under all circumstances, must be accompanied by motion in time; and that, in the case of our own system, motion in time and motion in space began together, and have gone on in conjunction ever since. It is very conceivable too, that there may have been reasons, unknown to ourselves at present, (though they may come to be known hereafter,) to render it necessary that the proportion, once established between precession in time and precession in space, should never be interrupted: and there are doubtless beings in the universe, who see and understand the reasons of this connection even now, whether we do or not; who are capable of comprehending the relations of time and place in the abstract; and to whose apprehensions, a sudden disturbance of these relations, in the case of our planet itself, would appear an anomaly, and a derangement of the harmony of a system from first to last, if it did not affect both members of the relation alike.

The question is then, last of all, What evidence there may be, even in this case, to satisfy us of the fact of such an addition; resolvable as it may be into a direct and positive appointment *ab extra?* The proper answer to this question, it appears to me, is supplied by this fact; viz., That though both the testimony of Scripture, and the course and succession of time itself, and the civil calendar at all times and everywhere, each concur to define and determine B.C. 4004, as the true epoch of the Mosaic creation; and the actual commencement of the decursus of time itself, in connection with our system, to be the point of the vernal equinox in that year; and though it must be admitted to be one of the most natural and probable presumptions imaginable, beforehand, that at the absolute commencement of the annual revolution of the earth, whatsoever that was, the line of the apsides and the line of the equinoxes would coincide; it does not appear from calculation that this was the case, B.C. 4004: and yet it does appear, even from calculation, to have been so nearly the case, as to authorize a very probable conjecture, that it must have been the case after all; and that it is only *per accidens*, in some way or other, that it does not appear to be the case at present.

The amount of the angular deviation of the line of the equinoxes from the line of the apsides, B.C. 4004, ought to be calculated with all possible care and minuteness, as far as calculations, carried back from the present day according to an uniform law, are able to determine it; if any argument is to be founded on the proportion of that angle to the accumulated effect of precession in a certain length of time: as for instance, two periods of 56 years each, or one of 112. As far as I have seen, however, all calculations make it less than 2°, though greater than 1°: and the truth seems to be that, in point of fact, it amounts to something precisely between the two: and may be assumed at 1° and a little more than 30m.

Now the annual amount of precession being supposed to be 50sec. 20thds., the accumulated effect of this annual quantity in 56 years, would be 46m. 58sec. 40thds.: and in 112 years, 1° 33m. 57sec. 20thds.: and (that we may here revert to the proportion between precession in time and precession in space,) an addition of 46m. 58sec. 40thds., to precession in space, on each of the two occasions in question, would be exactly proportionable to one of 12 hours to precession in time; and an addition of 1° 33m. 57sec. 20thds., to the former, as the joint effect of both miracles, would be exactly proportioned to one of 24 hours, as the united effect of both on the latter also. And this would approach so nearly to the actual magnitude of the angular deviation, B.C. 4004, as determined by the truest and most exact calculation, carried back according to an uniform rate of precession, from the present day, that we could scarcely consider it an accidental coincidence. But if it was not accidental, it would be demonstrative proof of the fact for which we are contending, viz., That between B.C. 4004 and the present day, there has been an addition to the annual amount of the precession, made *per saltum*, on two several occasions; and equal in the result to the magnitude of the angular deviation exactly; which no astronomer, in carrying back the precession from the present day, has ever yet thought of taking into account; but which, being taken into account, reduces the angular deviation, as shewn by calculation B.C. 4004, to nothing; and brings about a perfect coincidence of the line of the equinoxes, and of the axis major of the earth's orbit, (and along with that, of the true and the mean equinoxes also,) just at the point of time, when so many other coincidences, distinct from and independent of this, yet conspiring with it to one and the same result, would lead us to expect it.

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